SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT

MOI INTERNATIONAL AIRPORT

TENDER NO: KAA/OT/MIA/0087/2024-2025

FEBRUARY 2025

MANAGING DIRECTOR/CEO
KENYA AIRPORTS AUTHORITY
P.O. BOX 19001 - 00501
NAIROBI

GENERAL MANAGER (P&ES)
KENYA AIRPORTS AUTHORITY
P.O. BOX 19001 - 00501
NAIROBI

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INVITATION TO TENDER (ITT):

TENDER NO: KAA/OT/MIA/0087/2024-2025 **Date: 11TH FEBRUARY 2025**

TENDER NAME: SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT

1. The Kenya Airports Authority invites sealed tenders for the Supply, Delivery, And Installation 33kv/11kv Electrical Power Substation Complete With Structures And Associated Switchgear At Moi International Airport

2. Tendering will be conducted under open competitive method National using a standardized tender document. Tendering is open to all qualified and interested Tenderers.

3. Qualified and interested tenderers may obtain further information and inspect the Tender Documents during office hours *0800 to 1300hours and 1400 to 1700 hours at* the address given below.

4. A complete set of Tender documents are downloadable from the KAA supplier login screen using the link https://kaa.go.ke/corporate/procurement/. Tender documents obtained electronically will be free of charge

5. Tender documents may be viewed and downloaded for free from the website (www.kaa.go.ke). Tenderers who download the tender document must forward their particulars immediately to (tenders@kaa.go.ke, 6611000 and P.O Box 19001- 00501 Nairobi) to facilitate any further clarification or addendum

6. All Tenders must be accompanied by a tender security of **Kshs. 1,500,000.00**. Tenderers who have obtained digital tender security must provide together with a bid, a mechanism to verify the Tender Security such as the use of a **quick response (QR) code or an online portal.**

7. The tender shall be submitted online on or before **27th February 2025 at 11.00 am**. Interested bidders who are not in KAA system and therefore do not have login credentials should contact KAA procurement through email: tenders@kaa.go.ke for login credentials early enough and not later than three (3) days before tender closing date. All relevant submission documents must be attached on the login screen (Technical Proposal on Cfolder under technical Rfx Response system will lead you to the second screen (Cfolder) where the system creates a folder specific to you for uploading your response documents, click on "Tech Bid" the system will allow you to create a document, Click "create" button and attach the documents. and Financial Proposal on Price Submission Screen). A step by step manual/guide is available for downloading using the link https://www.kaa.go.ke/corporate/procurement/manuals/.

8. Tenders will be opened immediately after the deadline date and time specified above or any dead line date and time specified later. Tenders will be publicly opened in the presence of the Tenderers' designated representatives and anyone who chooses to attend at the address below.

9. Late tenders will be rejected.

10. The addresses referred to above are:

A. Address for obtaining further information and for purchasing tender documents

1) Name of Procuring Entity **KENYA AIRPORT AUTHORITY**

2) Physical address for hand Courier Delivery to an office or Tender Box (City, Street Name, Building, Floor Number and Room) **KENYA AIRPORT AUTHORITY HEAD OFFICE, 2ND FLOOR, PROCUREMENT DEPARTMENT, JKIA, NAIROBI**

3) Postal Address P.O **BOX 19001 – 00501 NAIROBI**

4) Officer to be contacted. – General Manager, Procurement and Logistics, Tel; 6611000, Email; tenders@kaa.go.ke

B. Address for Submission of Tenders.

1) Name of Procuring Entity **KENYA AIRPORT AUTHORITY**

2) Postal Address:

GENERAL MANAGER, PROCUREMENT AND LOGISTICS.

P.O BOX 19001-00501,

TEL: 6611000,

EMAIL: tenders@kaa.go.ke

NAIROBI.

3) Physical address for hand Courier Delivery to an office or Tender Box (City, Street Name, Building, Floor Number and Room) **KENYA AIRPORT AUTHORITY HEAD OFFICE, 2ND FLOOR, PROCUREMENT DEPARTMENT, JKIA, NAIROBI**

C. Address for Opening of Tenders.

1) Name of Procuring Entity **KENYA AIRPORT AUTHORITY**

2) Physical address for the location (City, Street Name, Building, Floor Number and Room)

KENYA AIRPORT AUTHORITY HEAD OFFICE, 2ND FLOOR, PROCUREMENT DEPARTMENT, JKIA, NAIROBI

Designation: **GENERAL MANAGER, PROCUREMENT AND LOGISTICS**

PART 1 - TENDERING PROCEDURES

SECTION I -INSTRUCTIONS TO TENDERERS

General

1. Scope of Tender

1.1 In connection with the Invitation to Tender (ITT), specified in the Tender Data Sheet (TDS), the Procuring Entity, issues this Tendering document for the Design, Supply and Installation of Plant and equipment as specified in Section VII, Procuring Entity's Requirements**.**

2. Definitions

2.1 Throughout this Tender document:

a) The term "in writing" means communicated in written form (e.g.by mail, e-mail, fax, including if specified **in the TDS,** distributed or received through the electronic-procurement system used by the Procuring Entity) with proof of receipt;

b) if the context so requires, "singular" means "plural" and vice versa; and

c) "Day" means calendar day, unless otherwise specified as "Business Day." A Business Day is any day that is an official working day in Kenya. It excludes the Kenya's official public holidays.

3. Fraud and Corruption

3.1 The Procuring Entity requires compliance with the provisions of the Public Procurement and Asset Disposal Act, 2015, Section 62 "Declaration not to engage in corruption". The tender submitted by a person shall include a declaration that the person shall not engage in any corrupt or fraudulent practice and a declaration that the person or his or her sub-contractors are not debarred from participating in public procurement proceedings.

3.2 The Procuring Entity requires compliance with the provisions of the Competition Act 2010, regarding collusive practices in contracting. Any tenderer found to have engaged in collusive conduct shall be disqualified and criminal and/or civil sanctions may be imposed. To this effect, Tenders shall be required to complete and sign the "Certificate of Independent Tender Determination" annexed to the Form of Tender.

3.3 Unfair Competitive Advantage-Fairness and transparency in the tender process require that the firms or their Affiliates competing for a specific assignment do not derive a competitive advantage from having provided consulting services related to this tender. To that end, the Procuring Entity shall indicate in the Data Sheet and make available to all the firms together with this tender document all information that would in that respect give such firm any unfair competitive advantage over competing firms.

3.4 Tenderers shall permit and shall cause their agents (where declared or not), subcontractors, sub consultants, service providers, suppliers, and their personnel, to permit the Procuring Entity to inspect all accounts, records and other documents relating to any initial selection process, prequalification process, tender submission, proposal submission, and contract performance (in the case of award), and to have them audited by auditors appointed by the Procuring Entity.

4. Eligible Tenderers

4.1 A Tenderer may be a firm that is a private entity, a state-owned enterprise or institution subject to ITT 4.6, or any combination of such entities in the form of a joint venture (JV) under an existing agreement or with the intent to enter into such an agreement supported by a Form of intent. In the case

of a joint venture, all members shall be jointly and severally liable for the execution of the entire Contract in accordance with the Contract terms. The JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the Tendering process and, in the event the JV is awarded the Contract, during contract execution. The maximum number of JV members shall be specified in the TDS.

4.2 Public Officers of the Procuring Entity and their relatives (i.e. spouse, child, parent, brother or sister and a child, parent, brother or sister of a spouse) their business associates or agents and firms/organizations in which they have a substantial or controlling interest shall not be eligible to tender or be awarded a contract. Public Officers are also not allowed to participate in any procurement proceedings.

4.3 A Tenderer shall not have a conflict of interest. Any Tenderer found to have a conflict of interest shall be disqualified. A Tenderer may be considered to have a conflict of interest for the purpose of this Tendering process, if the Tenderer:

a) Directly or indirectly controls, is controlled by or is under common control with another Tenderer; or

b) Receives or has received any direct or indirect subsidy from another Tenderer; or

c) Has the same legal representative as another Tenderer; or

d) Has a relationship with another Tenderer, directly or through common third parties, that puts it in a position to influence the Tender of another Tenderer, or influence the decisions of the Procuring Entity regarding this Tendering process; or

e) or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the Plant and Installation Services that are the subject of the Tender; or

f) or any of its affiliates has been hired (or is proposed to be hired) by the Procuring Entity as Project Manager for the Contract implementation; or

g) would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the project specified in the TDS ITT 2.1 that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; or

h) has a close business or family relationship with a professional staff of the Procuring Entity who:
(i) are directly or indirectly involved in the preparation of the Tendering document or specifications of the Contract, and/or the Tender evaluation process of such Contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Procuring Entity.

4.4 A tenderer shall not be involved in corrupt, coercive, obstructive or fraudulent practice. A tenderer that is proven to have been involved in any of these practices shall be automatically disqualified and would not be awarded a contract

4.5 A firm that is a Tenderer (either individually or as a JV member) shall not participate as a Tenderer or as JV member in more than one Tender except for permitted alternative Tenders. Such participation shall result in the disqualification of all Tenders in which the firm is involved. However, this does not limit the participation of a Tenderer as subcontractor in another Tender or of a firm as a subcontractor in more than one Tender.

4.6 A Tenderer may have the nationality of any country, subject to the restrictions pursuant to ITT 4.9. A Tenderer shall be deemed to have the nationality of a country if the Tenderer is constituted,

incorporated or registered in and operates in conformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the nationality of proposed subcontractors or sub-consultants for any part of the Contract including related Services.

4.7 A Tenderer that has been debarred by the PPRA shall be ineligible to be prequalified for, initially selected for, Tender for, propose for, financially or otherwise, during such period of time as the PPRA shall have determined. The list of debarred firms and individuals is available at PPRA Website www.ppra.go.ke.

4.8 Tenderers that are state-owned enterprises or institutions in Kenya may be eligible to compete and be awarded a Contract(s) only if they can establish that they (i) are legally and financially autonomous (ii) operate under commercial law, and (iii) are not under supervision of the Procuring Entity.

4.9 Firms and individuals may be ineligible if so indicated in Section V and (a)as a matter of law or official regulations, Kenya prohibits commercial relations with that country; or (b)by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, Kenya prohibits any import of goods or contracting of works or services from that country, or any payments to any country, person, or entity in that country. Where the procurement is implemented across jurisdictional boundaries, then exclusion of a firm or individual on the basis of ITT 4.8 (a) above by any country may be applied to that procurement across other countries involved.

4.10 Foreign tenderers are required to source at least forty (40%) percent of their contract inputs (in supplies, subcontracts and labour) from national suppliers and contractors. To this end, a foreign tenderer shall provide in its tender documentary evidence that this requirement is met. Foreign tenderers not meeting this criterion will be automatically disqualified. Information required to enable the Procuring Entity determine if this condition is met shall be provided in for this purpose is be provided in "SECTION III - EVALUATION AND QUALIFICATION CRITERIA, Item 9".

4.11 Pursuant to the eligibility requirements of ITT 4.10, a tender is considered a foreign tenderer, if it is registered in Kenya, has less than 51 percent ownership by nationals of Kenya and if it does not subcontract foreign contractors more than 10 percent of the contract price. JVs are considered as foreign tenderers if the individual member firms are registered in Kenya have less than 51 percent ownership by nationals of Kenya. The JV shall not subcontract to foreign firms more than 10 percent of the contract price.

4.12 The Competition Act 2010 requires that firms wishing to tender as Joint Venture undertakings which may prevent, distort or lessen competition in provision of services are prohibited unless they are exempt in accordance with the provisions of Section 25 of the Act. JVs will be required to seek for exemption from the Competition Authority of Kenya. Exemption shall not be a condition for tender, but it shall be a condition of contract award and signature. A JV tenderer shall be given opportunity to seek such exemption as a condition of award and signature of contract. Application for exemption from the Competition Authority of Kenya may be accessed from the website www.cak.go.ke

4.13 A Kenyan tenderer shall provide evidence of having fulfilled his/her tax obligations by producing a valid tax clearance certificate or tax exemption certificate issued by the Kenya Revenue Authority.

5. Eligible Goods, Plant and Equipment for Installation Services

5.1 The Plant and equipment for Installation Services to be supplied under the Contract may have their origin in any eligible country.

5.2 For purposes of ITT 5.1 above, “origin” means the place where the plant, or component parts thereof are mined, grown, produced or manufactured, and from which the services are provided. Plant components are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that is substantially in its basic characteristics or in purpose or utility from its components.

5.3 Any goods, works and production processes with characteristics that have been declared by the relevant national environmental protection agency or by other competent authority as harmful to human beings and to the environment shall not be eligible for procurement.

5.4 **Contents of Tendering Document**

6. Sections of Tendering Document

6.1 The Tendering document consists of Parts 1, 2, and 3, which include all the sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITT 10.

PART 1 - Tendering Procedures

i) Section I- Instructions to Tenderers (ITT)

ii) Section II-Tender Data Sheet (TDS)

iii) Section III- Evaluation and Qualification Criteria

iv) Section IV-Tendering Forms

v) Section V- Eligible Countries

vi) Section VI- Fraud and Corruption

PART 2 - Procuring Entity's Requirements

vii) Section VII-Procuring Entity's Requirements

PART 3 - Conditions of Contract and Contract Forms

viii) Section VIII- General Conditions of Contract (GCC)

ix) Section IX- Special Conditions of Contract (SCC)

x) Section X- Contract Forms

6.2 The Invitation to Tender Notice issued by the Procuring Entity is not part of the Tendering document.

6.3 Unless obtained directly from the Procuring Entity, the Procuring Entity is not responsible for the completeness of the document, responses to requests for clarification, the Minutes of the pre-Tender meeting (if any), or Addenda to the Tendering document in accordance with ITT 10. In case of any contradiction, documents obtained directly from the Procuring Entity shall prevail.

6.4 The Tenderer is expected to examine all instructions, forms, terms, and specifications in the Tendering document and to furnish with its Tender all information or documentation as is required by the Tendering document.

7. Site Visit

7.1 The Tenderer, at the Tenderer's own responsibility and risk, is encouraged to visit and examine the Site of the Required Services and its surroundings and obtain all information that may be necessary

for preparing the Tender and entering into a contract for the Services. The costs of visiting the Site shall be at the Tenderer's own expense.

8. Pre-Tender Meeting and a Pre-Arranged Pretender Visit of the Site of the Works

8.1 The Procuring Entity shall specify in the **TDS** if a pre-tender conference will be held, when and where. The Procuring Entity shall also specify in the **TDS** if a pre-arranged pretender visit of the site of the works will be held and when. The Tenderer's designated representative is invited to attend a pre- arranged pretender visit of the site of the works. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

8.2 The Tenderer is requested to submit any questions in writing, to reach the Procuring Entity not later than the period specified in the **TDS** before the meeting.

8.3 Minutes of the pre-Tender meeting and the pre-arranged pretender visit of the site of the works, if applicable, including the text of the questions asked by Tenderers and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Tenderers who have acquired the Tender Documents in accordance with ITT6.3. Minutes shall not identify the source of the questions asked.

8.4 The Procuring Entity shall also promptly publish anonymized (no names) Minutes of the pre-Tender meeting and the pre-arranged pretender visit of the site of the works at the webpage identified in the **TDS**. Any modification to the Tender Documents that may become necessary as a result of the pre-Tender meeting shall be made by the Procuring Entity exclusively through the issue of an Addendum pursuant to ITT10 and not through the minutes of the pre-Tender meeting. Nonattendance at the pre-Tender meeting will not be a cause for disqualification of a Tenderer.

9. Clarification of Tender Documents

9.1 A Tenderer requiring any clarification of the Tender Document shall contact the Procuring Entity in writing at the Procuring Entity's address specified in the **TDS** or raise its enquiries during the pre- Tender meeting and the pre-arranged pretender visit of the site of the works if provided for in accordance with ITT8.4. The Procuring Entity will respond in writing to any request for clarification, provided that such request is received no later than the period specified in the **TDS** prior to the deadline for submission of tenders. The Procuring Entity shall forward copies of its response to all tenderers who have acquired the Tender Documents in accordance with ITT6.3, including a description of the inquiry but without identifying its source. If so specified in the **TDS**, the Procuring Entity shall also promptly publish its response at the webpage identified in the **TDS**. Should the clarification result in changes to the essential elements of the Tender Documents, the Procuring Entity shall amend the Tender Documents appropriately following the procedure under ITT10.

10. Amendment of Tendering Document

10.1 At any time prior to the deadline for submission of Tenders, the Procuring Entity may amend the Tendering document by issuing addenda.

10.2 Any addendum issued shall be part of the tendering document and shall be communicated in writing to all who have obtained the tendering document from the Procuring Entity in accordance with ITT6.3. The Procuring Entity shall also promptly publish the addendum on the Procuring Entity's webpage

in accordance with ITT8.1.

10.3 To give prospective Tenderers reasonable time in which to take an addendum into account in preparing their Tenders, the Procuring Entity shall extend, as necessary, the deadline for submission of Tenders, in accordance with ITT24.2 below.

Preparation of Tenders

11. Cost of Tendering

11.1 The Tenderer shall bear all costs associated with the preparation and submission of its Tender, and the Procuring Entity shall not be responsible or liable for those costs, regardless of the conductor outcome of the Tendering process.

12. Language of Tender

12.1 The Tender, as well as all correspondence and documents relating to the Tender exchanged by the Tenderer and the Procuring Entity, shall be written in the English language. Supporting documents and printed literature that are part of the Tender may be in another language provided they are accompanied by an accurate translation of the relevant passages in the English Language, in which case, for purposes of interpretation of the Tender, such translation shall govern.

13. Documents Comprising the Tender

13.1 The Tender shall comprise the following:

a) **Form of Tender** prepared in accordance with ITT 14.1;

b) **Price Schedules** completed in accordance with ITT 14 and ITT 19;

c) **Tender Security** or **Tender Securing Declaration,** in accordance with ITT 22;

d) **Alternative Tender**, if permissible, in accordance with ITT 15;

e) **Authorization**: written confirmation authorizing the signatory of the Tender to commit the Tenderer, in accordance with ITT 23.3;

f) **Eligibility of Plant and Installation Services:** documentary evidence established in accordance with ITT 16.1 that the Plant and Installation Services offered by the Tenderer in its Tender or in any alternative Tender, if permitted, are eligible;

g) **Tenderer's Eligibility and Qualifications:** documentary evidence in accordance with ITT 17.1 establishing the Tenderer's eligibility and qualifications to perform the Contract if its Tender is accepted;

h) **Conformity:** documentary evidence in accordance to ITT18 that the Plant and Installation Services offered by the Tenderer conform to the Tendering document;

i) **Subcontractors: list of subcontractors** in accordance with ITT18.2; and

j) Any other document required **in the TDS**.

13.1 In addition to the requirements under ITT 13.1, Tenders submitted by a JV shall include a copy of the Joint Venture Agreement entered in to by all members. Alternatively, a Form of intent to execute a Joint Venture Agreement in the event of a successful Tender shall be signed by all members and submitted with the Tender, together with a copy of the proposed Agreement. The Tenderer shall serialize pages of all

tender documents submitted.

13.2 The Tenderer shall furnish in the Form of Tender information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Tender

14. Form of Tender and Price Schedules

14.1 The Form of Tender and Price Schedules shall be prepared, using the relevant forms furnished in Section IV, Tendering Forms. The forms must be completed as instructed in each form without any alterations to the text, and no substitutes shall be accepted except as provided under ITT 21.3. All blank spaces shall be filled in with the information requested.

15. Alternative Tenders

15.1 Unless otherwise specified in the **TDS**, alternative Tenders shall not be considered.

15.2 When alternatives to the Time Schedule are explicitly invited, a statement to that effect will be included in the **TDS**, and the method of evaluating different time schedules will be described in Section III, Evaluation and Qualification Criteria.

15.3 Except as provided under ITT 15.4 below, Tenderers wishing to offer technical alternatives to the Procuring Entity's requirements as described in the Tendering document must also provide: (i) a price at which they are prepared to offer a Plant meeting the Procuring Entity's requirements; and (ii) all information necessary for a complete evaluation of the alternatives by the Procuring Entity, including drawings, design calculations, technical specifications, breakdown of prices, and proposed installation methodology and other relevant details. Only the technical alternatives, if any, of the Tenderer with the Best Evaluated Tender conforming to the basic technical requirements shall be considered by the Procuring Entity.

15.4 When Tenderers are invited in the **TDS** to submit alternative technical solutions for specified parts of the facilities, such parts will be identified in the **TDS**, as will the method for their evaluation, and described in Section VII, Procuring Entity's Requirements.

16. Documents Establishing the Eligibility of the Plant and Installation Services

16.1 To establish the eligibility of the Plant and Installation Services in accordance with ITT 5, Tenderers shall complete the country-of-origin declarations in the Price Schedule Forms, included in Section IV, Tendering Forms.

17. Documents Establishing the Eligibility and Qualifications of the Tenderer

17.1 To establish its eligibility and qualifications to perform the Contract in accordance with Section III, Evaluation and Qualification Criteria, the Tenderer shall provide the information requested in the corresponding information sheets included in Section IV, Tendering Forms.

17.2 Tenderers shall be asked to provide, as part of the data for qualification, such information, including details of ownership, as shall be required to determine whether, according to the classification established by the Procuring Entity a supplier or group of suppliers qualifies for a margin of preference.

Further the information will enable the Procuring Entity identify any actual or potential conflict of interest in relation to the procurement and/or contract management processes, or a possibility of collusion between tenderers, and thereby help to prevent any corrupt influence in relation to the procurement process or contract management.

17.3 The purpose of the information described in ITT 15.1 above overrides any claims to confidentiality which a tenderer may have. There can be no circumstances in which it would be justified for a tenderer to keep information relating to its ownership and control confidential where it is tendering to undertake public sector work and receive public sector funds. Thus, confidentiality will not be accepted by the Procuring Entity as a justification for a Tenderer's failure to disclose, or failure to provide required information on its ownership and control.

17.4 The Tenderer shall provide further documentary proof, information or authorizations that the Procuring Entity may request in relation to ownership and control which information on any changes to the information which was provided by the tenderer under ITT 15.1. The obligations to require this information shall continue for the duration of the procurement process and contract performance and after completion of the contract, if any change to the information previously provided may reveal a conflict of interest in relation to the award or management of the contract.

17.5 All information provided by the tenderer pursuant to these requirements must be complete, current and accurate as at the date of provision to the Procuring Entity. In submitting the information required pursuant to these requirements, the Tenderer shall warrant that the information submitted is complete, current and accurate as at the date of submission to the Procuring Entity.

17.6 If a tenderer fails to submit the information required by these requirements, its tenderer will be rejected. Similarly, if the Procuring Entity is unable, after taking reasonable steps, to verify to a reasonable degree the information submitted by a tenderer pursuant to these requirements, then the tender will be rejected.

17.7 If information submitted by a tenderer pursuant to these requirements, or obtained by the Procuring Entity (whether through its own enquiries, through notification by the public or otherwise), shows any conflict of interest which could materially and improperly benefit the tenderer in relation to the procurement or contract management process, then:

i) if the procurement process is still ongoing, the tenderer will be disqualified from the procurement process,

ii) if the contract has been awarded to that tenderer, the contract award will be set aside,

iii) the tenderer will be referred to the relevant law enforcement authorities for investigation of whether the tenderer or any other persons have committed any criminal offence.

17.8 If a tenderer submits information pursuant to these requirements that is in complete, inaccurate or out- of-date, or attempts to obstruct the verification process, then the consequences ITT 6.7 will ensue unless the tenderer can show to the reasonable satisfaction of the Procuring Entity that any such act was not material, or was due to genuine error which was not attributable to the intentional act, negligence or recklessness of the tenderer.

18. Documents Establishing the Conformity of the Plant and Installation Services

18.1 The Tenderer shall furnish the information stipulated in Section IV, Tendering Forms in sufficient detail to demonstrate substantial responsiveness of the Tenderers' proposal to the work requirements

and the completion time.

18.2 For major items of Plant and Installation Services as listed by the Procuring Entity in Section III, Evaluation and Qualification Criteria, which the Tenderer intends to purchase or subcontract, the Tenderer shall give details of the name and nationality of the proposed Subcontractors, including manufacturers, for each of those items. In addition, the Tenderer shall include in its Tender information establishing compliance with the requirements specified by the Procuring Entity for these items. Quoted rates and prices will be deemed to apply to whichever Subcontractor is appointed, and no adjustment of the rates and prices will be permitted.

18.3 The Tenderer shall be responsible for ensuring that any Subcontractor proposed complies with the requirements of ITT 4, and that any plant, or services to be provided by the Subcontractor comply with the requirements of ITT 5 and ITT 15.1.

19. Tender Prices and Discounts

19.1 Unless otherwise specified in the **TDS**, Tenderers shall quote for the entire Plant and Installation Services on a "single responsibility" basis. The total Tender price shall include all the Contractor's obligations mentioned in or to be reasonably inferred from the Tendering document in respect of the design, manufacture, including procurement and subcontracting (if any), delivery, construction, installation and completion of the Plant. This includes all requirements under the Contractor's responsibilities for testing, pre-commissioning and commissioning of the plant and, where so required by the Tendering document, the acquisition of all permits, approvals and licenses, etc.; the operation, maintenance and training services and such other items and services as specified in the Tendering document, all in accordance with the requirements of the General Conditions. Items against which no price is entered by the Tenderer will not be paid for by the Procuring Entity when executed and shall be deemed to be covered by the prices for other items.

19.2 Tenderers are required to quote the price for the commercial, contractual and technical obligations outlined in the Tendering document.

19.3 Tenderers shall give a breakdown of the prices in the manner and detail called for in the Price Schedules included in Section IV, Tendering Forms.

19.4 Depending on the scope of the Contract, the Price Schedules may comprise up to the six (6) schedules listed below. Separate numbered Schedules included in Section IV, Tendering Forms, from those numbered1to4 below, shall be used for each of the elements of the Plant and Installation Services. The total amount from each Schedule corresponding to an element of the Plant and Installation Services shall be summarized in the schedule titled Grand Summary, (Schedule 5), giving the total Tender price (s) to be entered in the Form of Tender. Tenderers shall note that the plant and equipment included in Schedule Nos. 1 and 2 below exclude materials used for civil, building and other construction works. All such materials shall be included and priced under Schedule No.4, Installation Services. The Schedules comprise:

Schedule No. 1: Plant (including Mandatory Spare Parts) Supplied from Abroad

Schedule No. 2: Plant (including Mandatory Spare Parts) Supplied from within Kenya

Schedule No. 3: Design Services

Schedule No. 4: Installation Services

Schedule No. 5: Grand Summary (Schedule Nos.1to4)

Schedule No. 6: Recommended Spare Parts

19.5 In the Schedules, Tenderers shall give the required details and a breakdown of their prices as follows:

a) Plant to be supplied from a broad (Schedule No.1):

The price of the Plant shall be quoted on CIP-named place of destination basis as specified **in the TDS,** including all taxes payable in Kenya.

b) Plant manufactured within Kenya (Schedule No.2):

i) The price of the plant shall be quoted on an EXW Incoterm basis (such as "ex-works," "ex- factory," "ex-warehouse" or "off-the-shelf," as applicable);

ii) Sales tax and all other taxes payable in Kenya on the plant if the contract is awarded to the Tenderer; and

iii) The total price for the item.

c) Design Services (Schedule No.3);

d) Installation Services shall be quoted separately (Schedule No.4) and shall include rates or prices for local transportation to named place of final destination as specified **in the TDS**, insurance and other services incidental to delivery of the plant, all labor, contractor's equipment, temporary works, materials, consumables and all matters and things of whatsoever nature, including operations and maintenance services, the provision of operations and maintenance manuals, training, etc., where identified in the Tendering document, as necessary for the proper execution of the installation and other services, including all taxes, duties, levies and charges payable in Kenya as of twenty-eight (28) days prior to the deadline for submission of Tenders;

e) Recommended spare parts shall be quoted separately (Schedule 6) as specified in either subparagraph (a) or (b) above in accordance with the origin of the spare parts.

19.6 The terms EXW, CIP, and other similar terms shall be governed by the rules prescribed in the current edition of Incoterms, published by the International Chamber of Commerce, as specified in the **TDS**.

19.7 The prices shall be either fixed or adjustable as specified in the **TDS**.

19.8 In the case of Fixed Price, prices quoted by the Tenderer shall be fixed during the Tenderer's performance of the contract and not subject to variation on any account. A Tender submitted with an adjustable price quotation will be treated as non-responsive and rejected.

19.9 In the case of Adjustable Price, prices quoted by the Tenderer shall be subject to adjustment during performance of the contract to reflect changes in the cost elements such as labor, material, transport and contractor's equipment in accordance with the procedures specified in the corresponding Appendix to the Contract Agreement. A Tender submitted with a fixed price quotation will not be rejected, but the price adjustment will be treated as zero. Tenderers are required to indicate the source of labor and material indices in the corresponding Form in Section IV, Tendering Forms.

19.10 If so indicated in ITT 1.1, Tenders are being invited for individual lots (contracts) or for any combination of lots (packages). Tenderers wishing to offer any price reduction (discount) for the award of more than one Contract shall specify in their Form of Tender the price reductions applicable to each package, or alternatively, to individual Contracts within the package, and the manner in which the price reductions will apply.

19.11 Tenderers wishing to offer any unconditional discount shall specify in their Form of Tender the

offered discounts and the manner in which price discounts will apply.

20. Currencies of Tender and Payment

20.1 The currency(ies) of the Tender and the currency(ies) of payments shall be the same. The Tenderer shall quote in the currency of Kenya the portion of the Tender price that corresponds to expenditures incurred in the currency of Kenya, unless otherwise specified in the **TDS**.

20.2 The Tenderer may express the Tender price in any currency. If the Tenderer wishes to be paid in a combination of amounts in different currencies, it may quote its price accordingly but shall use no more than three foreign currencies in addition to the currency of Kenya.

21. Period of Validity of Tenders

21.1 Tenders shall remain valid for the Tender Validity period specified **in the TDS**. The Tender Validity period starts from the Tender submission deadline (as prescribed by the Procuring Entity in accordance with ITT 23.1). A Tender valid for a shorter period shall be rejected by the Procuring Entity as non-responsive.

21.2 In exceptional circumstances, prior to the expiration of the Tender validity period, the Procuring Entity may request Tenderers to extend the period of validity of their Tenders. The request and the responses shall be made in writing. If a Tender Security is requested in accordance with ITT 20, the Tenderer granting the request shall also extend the Tender Security for twenty-eight (28) days beyond the deadline of the extended validity period. A Tenderer may refuse the request without forfeiting its Tender Security. A Tenderer granting the request shall not be required or permitted to modify its Tender, except as provided in ITT 19.3.

21.3 If the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial Tender validity period, the Contract price shall be determined as follows:

a) In the case of **fixed price** contracts, the Contract price shall be the Tender price adjusted by the factor or factors specified **in the TDS**;

b) In the case of **adjustable price** contracts, no adjustment shall be made; or

c) In any case, Tender evaluation shall be based on the Tender price without taking into consideration the applicable correction from those indicated above.

22. Tender Security

22.1 The Tenderer shall furnish as part of its Tender, either a Tender-Securing Declaration or a Tender Security as specified **in the TDS,** in original form and, in the case of a Tender Security, in the amount and currency specified **in the TDS**.

22.2 A Tender-Securing Declaration shall use the form included in Section IV Tendering Forms.

22.3 If a Tender Security is specified pursuant to ITT 20.1, the Tender security shall be a demand guarantee in any of the following forms at the Tenderer's option:

a) cash;

b) a bank guarantee;

c) a guarantee by an insurance company registered and licensed by the Insurance Regulatory Authority listed by the Authority; or

d) a guarantee issued by a financial institution approved and licensed by the Central Bank of Kenya,

22.4 If a Tender Security or a Tender-Securing Declaration is specified pursuant to ITT 20.1, any Tender not accompanied by a substantially responsive Tender Security or Tender-Securing Declaration shall be rejected by the Procuring Entity as non-responsive.

22.5 If a Tender Security is specified pursuant to ITT 20.1, the Tender Security of unsuccessful Tenderers shall be returned as promptly as possible upon the successful Tenderer's furnishing of the Performance Security pursuant to ITT 47.

22.6 The Tender Security of the successful Tenderer shall be returned as promptly as possible once the successful Tenderer has signed the Contract and furnished the required Performance Security.

22.7 The Tender Security may be forfeited or the Tender-Securing Declaration executed:

a) If a Tenderer withdraws its Tender during the period of Tender validity specified by the Tenderer on the Form of Tender; or

b) If the successful Tenderer fails to**:**

i) Sign the Contract in accordance with ITT 47; or

ii) Furnish a performance security in accordance with ITT 48.

22.8 Where the Tender-Securing Declaration is executed the Procuring Entity will recommend to the PPRA to debars the Tenderer from participating in public procurement as provided in the law.

22.9 The Tender Security or the Tender-Securing Declaration of a JV shall be in the name of the JV that submits the Tender. If the JV has not been legally constituted into a legally enforceable JV at the time of Tendering, the Tender Security or the Tender Securing Declaration shall be in the names of all future members as named in the Form of intent referred to in ITT 4.1and ITT 11.2.

23. Format and Signing of Tender

23.1 The Tenderer shall prepare one original of the documents comprising the Tender as described in ITT 11 and clearly mark it “Original.” Alternative Tenders, if permitted in accordance with ITT 13, shall be clearly marked “Alternative”. In addition, the Tenderer shall submit copies of the Tender, in the number specified in the TDS and clearly mark them “Copy.” In the event of any discrepancy between the original and the copies, the original shall prevail.

23.2 Tenderers shall mark as “CONFIDENTIAL” information in their Tenders which is confidential to their business. This may include proprietary information, trade secrets or commercial or financially sensitive information.

23.3 The original and all copies of the Tender shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Tenderer. This authorization shall consist of a written confirmation as specified in the **TDS** and shall be attached to the Tender. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Tender where entries or amendments have been made shall be signed or initialled by the person signing the Tender.

23.4 In the case that the Tenderer is a JV, the Tender shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives.

23.5 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Tender.

Submission and Opening of Tenders

24. Submission, Sealing and Marking of Tenders

24.1 The Tenderer shall deliver the Tender in a single, sealed envelope (one (1) envelope process). The Tenderer shall place the following separate, sealed envelopes:

Inner Envelops:

a) In an envelope marked "ORIGINAL", all documents comprising the Tender, as described in ITT11; and

b) In an envelope marked "COPIES", all required copies of the Tender; and

c) If alternative Tenders are permitted in accordance with ITT 13, and if relevant:

i) In an envelope marked "ORIGINAL–ALTERNATIVE TENDER" the alternative Tender; and

ii) in the envelope marked "COPIES – ALTERNATIVE TENDER" all required copies of the alternative Tender.

The inner envelopes shall:

a) Bear the name and address of the Tenderer;

b) Be addressed to the Procuring Entity in accordance with ITT 23.1;

c) Bear the specific identification of this Tendering process indicated in accordance with ITT 1.1; and

d) Bear a warning not to open before the time and date for Tender opening.

The outer envelope (s) in which the inner envelops are enclosed shall:

a) Be addressed to the Procuring Entity in accordance with ITT 23.1;

b) Bear the specific identification of this Tendering process indicated in accordance with ITT 1.1; and

c) Bear a warning not to open before the time and date for Tender opening.

24.2 If all envelopes are not sealed and marked as required, the Procuring Entity will assume no responsibility for the misplacement or premature opening of the Tender. Tenders that are misplaced or opened prematurely will not be accepted.

25. Deadline for Submission of Tenders

25.1 Tenders must be received by the Procuring Entity at the address and no later than the date and time indicated in the **TDS**. When so specified in the **TDS**, Tenderers shall have the option of submitting their Tenders electronically. Tenderers submitting Tenders electronically shall follow the electronic Tender submission procedures specified in the **TDS**.

25.2 The Procuring Entity may, at its discretion, extend the deadline for the submission of Tenders by

amending the Tendering document in accordance with ITT8, in which case all rights and obligations of the Procuring Entity and Tenderers previously subject to the deadline shall thereafter be subject to the deadline as extended.

26. Late Tenders

26.1 The Procuring Entity shall not consider any Tender that arrives after the deadline for submission of Tenders, in accordance with ITT 23. Any Tender received by the Procuring Entity after the deadline for submission of Tenders shall be declared late, rejected, and returned unopened to the Tenderer.

27. Withdrawal, Substitution, and Modification of Tenders

27.1 A Tenderer may withdraw, substitute, or modify its Tender after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITT 21.3, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Tender must accompany the respective written notice. All notices must be:

a) prepared and submitted in accordance with ITT 21 and ITT 22 (except that withdrawals notices do not require copies), and in addition, the respective envelopes shall be clearly marked “Withdrawal,” “Substitution,” “Modification”; and

b) received by the Procuring Entity prior to the deadline prescribed for submission of Tenders, in accordance with ITT 23.

27.2 Tenders requested to be withdrawn in accordance with ITT25.1 shall be returned unopened to the Tenderers.

27.3 No Tender may be withdrawn, substituted, or modified in the interval between the deadline for submission of Tenders and the expiration of the period of Tender validity specified by the Tenderer on the Form of Tender or any extension thereof.

28. Tender Opening

28.1 Except as in the cases specified in ITT24 and ITT25.2, the Procuring Entity shall publicly open and read out in accordance with ITT26.5 all Tenders received by the deadline at the date, time and place specified **in the TDS** in the presence of Tenderers' designated representatives and anyone who choose to attend. Any specific electronic Tender opening procedures required if electronic Tendering is permitted in accordance with ITT 23.1, shall be as specified **in the TDS**.

28.2 First, the written notice of withdrawal in the envelopes marked “Withdrawal” shall be opened and read out and the envelope with the corresponding Tender shall not be opened, but returned to the Tenderer. No Tender withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at Tender opening.

28.3 Next, envelopes marked “Substitution” shall be opened and read out and exchanged with the corresponding Tender being substituted, and the substituted Tender shall not be opened, but returned to the Tenderer. No Tender substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at Tender opening.

28.4 Next, envelopes marked “Modification” shall be opened and read out with the corresponding Tender. No Tender modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at Tender opening.

28.5 Next, all remaining envelopes shall be opened one at a time, reading out: the name of the Tenderer and the Tender Price(s), including any discounts and alternative Tenders, and indicating whether there is a modification; the presence or absence of a Tender Security or Tender-Securing Declaration, if required; and any other details as the Procuring Entity may consider appropriate.

28.6 Only Tenders, alternative Tenders and discounts that are opened and read out at Tender opening shall be considered further. The Form of Tender and the Price Schedules are to be initialled by representatives of the Procuring Entity attending Tender opening in the manner specified in the **TDS**.

28.7 The Procuring Entity shall neither discuss the merits of any Tender nor reject any Tender (except for late Tenders, in accordance with ITT 24.1).

28.8 The Procuring Entity shall prepare a record of the Tender opening that shall include, as a minimum:

a) The name of the Tenderer and whether there is a withdrawal, substitution, or modification;

b) The Tender Price, per lot if applicable, including any discounts;

c) Any alternative Tenders; and

d) The presence or absence of a Tender Security or a Tender-Securing Declaration.

e) Number of pages for each tender

28.9 The Tenderers' representatives who are present shall be requested to sign the record. The omission of a Tenderer's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Tenderers.

Evaluation and Comparison of Tenders

29. Confidentiality

29.1 Information relating to the evaluation of Tenders and recommendation of contract award, shall not be disclosed to Tenderers or any other persons not officially concerned with the Tendering process until information on Intention to Award the Contract is transmitted to all Tenderers in accordance with ITT 42.

29.2 Any effort by a Tenderer to influence the Procuring Entity in the evaluation of the Tenders or Contract award decisions may result in the rejection of its Tender.

29.3 Notwithstanding ITT 27.2, from the time of Tender opening to the time of Contract Award, if any Tenderer wishes to contact the Procuring Entity on any matter related to the Tendering process, it should do so in writing.

30. Clarification of Tenders

30.1 To assist in the examination, evaluation, and comparison of the Tenders, and qualification of the

Tenderers, the Procuring Entity may, at its discretion, ask any Tenderer for a clarification of its Tender. Any clarification submitted by a Tenderer that is not in response to a request by the Procuring Entity shall not be considered. The Procuring Entity's request for clarification and the response shall be in writing. No change in the prices or substance of the Tender shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Procuring Entity in the evaluation of the Tenders, in accordance with ITT32.

30.2 If a Tenderer does not provide clarifications of its Tender by the date and time set in the Procuring Entity's request for clarification, its Tender may be rejected.

31. Deviations, Reservations, and Omissions

31.1 During the evaluation of Tenders, the following definitions apply:

a) "Deviation" is a departure from the requirements specified in the Tendering document;

b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Tendering document; and

c) "Omission" is the failure to submit part or all of the information or documentation required in the Tendering document.

32. Determination of Responsiveness

32.1 The Procuring Entity's determination of a Tender's responsiveness is to be based on the contents of the Tender itself, as defined in ITT 11.

32.2 A substantially responsive Tender is one that meets the requirements of the Tendering document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that:

a) If accepted, would:

i) Affect in any substantial way the scope, quality, or performance of the Plant and Installation Services specified in the Contract; or

ii) Limit in any substantial way, in consistent with the Tendering document, the Procuring Entity's rights or the Tenderer's obligations under the proposed Contract; or

b) if rectified, would unfairly affect the competitive position of other Tenderers presenting substantially responsive Tenders.

32.3 The Procuring Entity shall examine the technical aspects of the Tender in particular, to confirm that all requirements of Section VII, Procuring Entity's Requirements have been met without any material deviation, reservation, or omission.

32.4 If a Tender is not substantially responsive to the requirements of the Tendering document, it shall be rejected by the Procuring Entity and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

33. Nonmaterial Non-conformities

33.1 Provided that a Tender is substantially responsive, the Procuring Entity may waive any

nonconformity in the Tender.

33.2 Provided that a Tender is substantially responsive, the Procuring Entity may request that the Tenderer submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial non- conformities in the Tender related to documentation requirements. Requesting information or documentation on such non-conformities shall not be related to any aspect of the price of the Tender. Failure of the Tenderer to comply with the request may result in the rejection of its Tender.

33.3 Provided that a Tender is substantially responsive, the Procuring Entity shall rectify quantifiable non material non-conformities related to the Tender Price. To this effect, the Tender Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component in the manner specified **in the TDS**.

34. Correction of Arithmetical Errors

34.1 Provided that the tender is substantially responsive, the Procuring Entity shall correct arithmetical errors on the following basis:

i) If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Procuring Entity there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

ii) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

iii) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

34.2 Any error detected if considered a major deviation that affects the substance of the tender, shall lead to disqualification of the tender as non-responsive. The method of determining the error as a major deviation shall be specified in the **TDS**.

34.3 Corrected tender prices shall not be used in the evaluation of tenders, comparison of tender prices.

34.4 The Procuring Entity shall calculate the difference between the corrected price and tender price and work out the percentage difference, which will be plus or minus tender price as the case may be; [i.e. (corrected tender price– tender price)/ tender price X100]. This percentage difference between corrected tender price and tender price may be used to determine if the error so detected is considered a major deviation that affects the substance of the tender.

34.5 On award of contract, all payment valuation certificates, variation orders on omissions and additions valued based on rates in the Bill of Quantities will be adjusted by such a percentage specified in ITT 31.4 to ensure contractor is not paid less or more relative to the contract price which would be the tender price.

35. Conversion to Single Currency

35.1 For evaluation and comparison purposes, the currency(ies) of the Tender shall be converted into a single currency as specified **in the TDS.**

36. Margin of Preference

36.1 A margin of preference may be allowed on locally manufactured goods (plant and equipment) only when the contract is open to international tendering, where the tender is likely to attract foreign goods and where the contract exceeds the threshold specified in the Regulations.

36.2 A margin of preference shall not be allowed unless it is specified so in the **TDS**.

36.3 Contracts procured on basis of international tendering and competition shall not be subject to reservations exclusive/ specific groups under women, youth and persons living with disability.

36.4 Where it is intended to reserve a contract to a specific group of businesses (these groups are Small and Medium Enterprises, Women Enterprises, Youth Enterprises and Enterprises of persons living with disability, as the case may be), and who are appropriately registered as such by a competent authority, a procuring entity shall ensure that the invitation to tender specifically indicates that only businesses or firms belonging to the specified group are eligible to tender. Tender shall be reserved to only one group. If not so stated in the Tender documents, the invitation to tender will be open to all interested tenderers.

37. Evaluation of Tenders

37.1 The Procuring Entity shall use the criteria and methodologies listed in this ITT and Section III, Evaluation and Qualification criteria. No other evaluation criteria or methodologies shall be permitted. By applying the criteria and methodologies the Procuring Entity shall determine the Best Evaluated Tender. This is the Tender of the Tenderer that meets the qualification criteria and that has been determined to be:

a) Most responsive to the Tendering document; and

b) The lowest evaluated cost.

37.2 **Technical Evaluation**. The Procuring Entity will carry out a detailed technical evaluation of the Tenders not previously rejected to determine whether the technical aspects are incompliance with the Tendering document. The Tender that does not meet minimum acceptable standards of completeness, consistency and detail, and the specified minimum (or maximum, as the case may be) requirements for specified functional guarantees, will be rejected for non-responsiveness. In order to reach its determination, the Procuring Entity will examine and compare the technical aspects of the Tenders on the basis of the information supplied by the Tenderers, taking into account the following:

a) Overall completeness and compliance with the Procuring Entity's Requirements; conformity of the Plant and Installation Services offered with specified performance criteria, including conformity with the specified minimum (or maximum, as the case may be) requirement corresponding to each functional guarantee, as indicated in the Specification and in Section III, Evaluation and Qualification Criteria; suitability of the Plant and Installation Services offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the Tender;

b) type, quantity and long-term availability of mandatory and recommended spare parts and maintenance services; and

c) other relevant factors, if any, listed in Section III, Evaluation and Qualification Criteria.

37.3 Where alternative technical solutions have been allowed in accordance with ITT 13, and offered

by the Tenderer, the Procuring Entity will make a similar evaluation of the alternatives. Where alternatives have not been allowed but have been offered, they shall be ignored.

37.4 **Economic Evaluation**. To evaluate a Tender, the Procuring Entity shall consider the following:

a) the Tender price, excluding provisional sums and the provision, if any, for contingencies in the Price Schedules;

b) price adjustment due to discounts offered in accordance with ITT 17.11;

c) price adjustment due to quantifiable non material non-conformities in accordance with ITT 31.3;

d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITT 33; and

e) the evaluation factors specified **in the TDS** and in Section III, Evaluation and Qualification Criteria.

37.5 If price adjustment is allowed in accordance with ITT 17.7, the estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Tender evaluation.

37.6 In the case of multiple contracts or lots, Tenderers are allowed to tender for one or more lots and the methodology to determine the lowest evaluated cost of the lot (contract) and for combinations, including any discounts offered in the Form of Tender, is specified in Section III, Evaluation and Qualification Criteria.

38. Comparison of Tenders

38.1 The Procuring Entity shall compare the evaluated costs of all substantially responsive Tenders established in accordance with ITT 35.4 to determine the Tender that has the lowest evaluated cost.

39. Abnormally Low Tenders and Abnormally High Tenders

39.1 An Abnormally Low Tender is one where the Tender price, in combination with other elements of the Tender, appears so low that it raises material concerns as to the capability of the Tenderer to perform the Contract for the offered Tender Price or that genuine competition between Tenderers is compromised.

39.2 In the event of identification of a potentially Abnormally Low Tender, the Procuring Entity shall seek written clarifications from the Tenderer, including detailed price analyses of its Tender price in correlation to the subject matter of the contract, scope, proposed methodology, schedule, allocation of risks and responsibilities and any other requirements of the Tendering document.

39.3 After evaluation of the price analyses, in the event that the Procuring Entity determines that the Tenderer has failed to demonstrate its capability to deliver the contract for the offered tender price, the Procuring Entity shall reject the Tender.

39.4 An abnormally high price is one where the tender price, in combination with other constituent elements of the Tender, appears unreasonably too high to the extent that the Procuring Entity is concerned that it (the Procuring Entity) may not be getting value for money or it may be paying too high a price for the contract compared with market prices or that genuine competition between Tenderers is compromised.

39.5 In case of an abnormally high tender price, the Procuring Entity shall make a survey of the market

prices, check if the estimated cost of the contract is correct and review the Tender Documents to check if the specifications, scope of work and conditions of contract are contributory to the abnormally high tenders. The Procuring Entity may also seek written clarification from the tenderer on the reason for the high tender price. The Procuring Entity shall proceed as follows:

i) If the tender price is abnormally high based on wrong estimated cost of the contract, the Procuring Entity may accept or not accept the tender depending on the Procuring Entity's budget considerations.

ii) If specifications, scope of work and/or conditions of contract are contributory to the abnormally high tender prices, the Procuring Entity shall reject all tenders and may retender for the contract based on revised estimates, specifications, scope of work and conditions of contract, as the case may be.

39.6 If the Procuring Entity determines that the Tender Price is abnormally too high because genuine competition between tenderers is compromised (*often due to collusion, corruption or other manipulations*), the Procuring Entity shall reject all Tenders and shall institute or cause competent Government Agencies to institute an investigation on the cause of the compromise, before retendering.

40. Unbalanced or Front-Loaded Tenders

40.1 If the Tender that is evaluated as the lowest evaluated cost is, in the Procuring Entity's opinion, seriously unbalanced or front loaded the Procuring Entity may require the Tenderer to provide written clarifications. Clarifications may include detailed price analyses to demonstrate the consistency of the Tender prices with the scope of works, proposed methodology, schedule and any other requirements of the Tendering document.

40.2 After the evaluation of the information and detailed price analyses presented by the Tenderer, the Procuring Entity may:

a) Accept the Tender; or

b) If appropriate, require that the total amount of the Performance Security be increased, at the expense of the Tenderer, to a level not exceeding twenty percent (10%) of the Contract Price; or

c) Reject the Tender.

41. Eligibility and Qualification of the Tenderer

41.1 The Procuring Entity shall determine to its satisfaction whether the Tenderer that is selected as having submitted the lowest evaluated cost and substantially responsive Tender is eligible and meets the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.

41.2 The determination shall be based upon an examination of the documentary evidence of the Tenderer's qualifications submitted by the Tenderer, pursuant to ITT 15.1. The determination shall not take into consideration the qualifications of other firms such as the Tenderer's subsidiaries, parent entities, affiliates, subcontractors (other than Specialized Subcontractors if permitted in the Tendering document) or any other firm (s) different from the Tenderer.

41.3 An affirmative determination shall be a prerequisite for award of the Contract to the Tenderer. A negative determination shall result in disqualification of the Tender, in which event the Procuring Entity shall proceed to the Tenderer who offers a substantially responsive Tender with the next lowest evaluated cost to make a similar determination of that Tenderer's qualifications to perform satisfactorily.

41.4 The capabilities of the manufacturers and subcontractors proposed in its Tender to be used by

the Tenderer with the Lowest Evaluated Tender for identified major items of supply or services will also be evaluated for acceptability in accordance with Section III, Evaluation and Qualification Criteria. Their participation should be confirmed with a Form of intent between the parties, as needed. Should a manufacturer or subcontractor be determined to be unacceptable, the Tender will not be rejected, but the Tenderer will be required to substitute an acceptable manufacturer or subcontractor without any change to the Tender price. Prior to signing the Contract,

The corresponding Appendix to the Contract Agreement shall be completed, listing the approved manufacturers or subcontractors for each item concerned.

42. Procuring Entity's right to Accept Any Tender and to Reject Any or All Tenders

42.1 The Procuring Entity reserves the right to accept or reject any Tender, and to annul the Tendering process and reject all Tenders at any time prior to Contract Award, without there by incurring any liability to Tenderers. In case of annulment, all Tenders submitted and specifically, Tender securities shall be promptly returned to the Tenderers.

Award of Contract

43. Award Criteria

43.3 Subject to ITT 40, the Procuring Entity shall award the Contract to the successful Tenderer. This is the Tenderer whose Tender has been determined to be the Lowest Evaluated Tender. This is the Tender of the Tenderer that meets the qualification criteria and whose Tender has been determined to be:

a) Substantially responsive to the Tendering Document; and

b) The lowest evaluated cost

44. Notice of Intention to Enter into a Contract/ Notification of Award

44.1 When a Standstill Period applies, it shall commence when the Procuring Entity has transmitted to each Tenderer the Notification of Intention to Award the Contract to the successful Tenderer. The Notification of Intention to Award shall contain, at a minimum, the following information:

a) The name and address of the Tenderer submitting the successful Tender;

b) The Contract price of the successful Tender;

c) A statement of the reason (s) the Tender (of the unsuccessful Tenderer to whom the Form is addressed) was unsuccessful, unless the price information in c) above already reveals the reason;

d) The expiry date of the Standstill Period; and

e) Instructions on how to request a debriefing and/ or submit a complaint during the standstill period.

45. Standstill Period

45.1 The Contract shall not be signed earlier than the expiry of a Standstill Period of 14 days to allow any dissatisfied tender to launch a complaint. Where only one Tender is submitted, the Standstill Period shall not apply.

45.2 Where a Standstill Period applies, it shall commence when the Procuring Entity has transmitted to each Tenderer the Notification of Intention to Enter in to a Contract with the successful Tenderer.

46. Debriefing by the Procuring Entity

46.1 On receipt of the Procuring Entity's Notification of Intention to Enter into a Contract referred to in ITT 43, an unsuccessful tenderer may make a written request to the Procuring Entity for a debriefing on specific issues or concerns regarding their tender. The Procuring Entity shall provide the debriefing within five days of receipt of the request.

46.2 Debriefings of unsuccessful Tenderers may be done in writing or verbally. The Tenderer shall bear its own costs of attending such a debriefing meeting.

47. Letter of Award

47.1 Prior to the expiry of the Tender Validity Period and upon expiry of the Standstill Period specified in ITT 43.1, upon addressing a complaint that has been filed within the Standstill Period, the Procuring Entity shall transmit the Letter of Award to the successful Tenderer. The letter of award shall request the successful tenderer to furnish the Performance Security within 21 days of the date of the letter.

48. Signing of Contract

48.1 Upon the expiry of the fourteen days of the Notification of Intention to enter into contract and upon the parties meeting their respective statutory requirements, the Procuring Entity shall send the successful Tenderer the Contract Agreement.

48.2 Within fourteen (14) days of receipt of the Contract Agreement, the successful Tenderer shall sign, date, and return it to the Procuring Entity.

48.3 The written contract shall be entered into within the period specified in the notification of award and before expiry of the tender validity period

48.4 Notwithstanding ITT 46.2 above, in case signing of the Contract Agreement is prevented by any export restrictions attributable to the Procuring Entity, to the country of the Procuring Entity, or to the use of the Plant and Installation Services to be supplied, where such export restrictions arise from trade regulations from a country supplying those Plant and Installation Services, the Tenderer shall not be bound by its Tender, always provided, however, that the Tenderer can demonstrate to the satisfaction of the Procuring Entity that signing of the Contact Agreement has not been prevented by any lack of diligence on the part of the Tenderer in completing any formalities, including applying for permits, authorizations and licenses necessary for the export of the Plant and Installation Services under the terms of the Contract.

49. Performance Security

49.1 Within twenty-one (21) days of the receipt of the Form of Acceptance from the Procuring Entity, the successful Tenderer shall furnish the Performance Security in accordance with the General Conditions GCC 13.3, subject to ITT 38, using for that purpose the Performance Security Form included in Section X, Contract Forms, or another form acceptable to the Procuring Entity. If the Performance Security furnished

by the successful Tenderer is in the form of a bond, it shall be issued by a bonding or insurance company that has been determined by the successful Tenderer to be acceptable to the Procuring Entity. A foreign institution providing a bond shall have a correspondent financial institution located in Kenya, unless the Procuring Entity has agreed in writing that a correspondent financial institution is not required.

49.2 Failure of the successful Tenderer to submit the above-mentioned Performance Security or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the Tender Security. In that event the Procuring Entity may award the Contract to the Tenderer offering the next Best Evaluated Tender.

50. Publication of Procurement Contract

50.1 Within fourteen days after signing the contract, the Procuring Entity shall publish the awarded contract at its notice boards and websites; and on the Website of the Authority. At the minimum, the notice shall contain the following information:

a) Name and address of the Procuring Entity;
b) name and reference number of the contract being awarded, a summary of its scope and the selection method used;
c) the name of the successful Tenderer, the final total contract price, the contract duration.
d) Dates of signature, commencement and completion of contract;
e) Names of all Tenderers that submitted Tenders, and their Tender prices as read out at Tender opening.

51. Appointment of Adjudicator

51.1 The Procuring Entity proposes the person named **in the TDS** to be appointed as Adjudicator under the Contract, at the hourly fee specified **in the TDS**, plus reimbursable expenses. If the Tenderer disagrees with this proposal, the Tenderer should so state in his Tender. If, in the Letter of Acceptance, the Procuring Entity does not agree on the appointment of the Adjudicator, the Procuring Entity will request the Appointing Authority designated in the Special Conditions of Contract (SCC) pursuant to Clause 23.1 of the General Conditions of Contract (GCC), to appoint the Adjudicator.

52. Procurement Related Complaint and Administrative Review

51.1 The procedures for making a Procurement-related Complaint are as specified in the **TDS.**

51.2 A request for administrative review shall be made in the form provided under contract forms.

SECTION II - TENDER DATA SHEET

The following specific data for the Facilities to be procured shall complement, supplement, or amend the provisions in the Instructions to Tenderers (ITT). Whenever there is a conflict, the provisions here in shall prevail over those in ITT.

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
A. General	
ITT 1.1	The reference number of the Invitation to Tender (ITT) is: **TENDER NO: KAA/OT/MIA/0087/2024-2025** The Procuring Entity is: **KENYA AIRPORTS AUTHORITY** The name of the ITT is: **SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT** The number and identification of lots (contracts)comprising this ITT is: **N/A** The name of the Project is: **SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT**
ITT 2.1	Electronic –Procurement System shall be used. The Procuring Entity shall use the following electronic-procurement system to manage this Tendering process: Completed Tender documents and its attachments must be submitted online before the closing date. All relevant submission documents must be attached on the login screen (Technical Proposal on C-folder under Technical Rfx Response system will lead you to the second screen (C-folder) where the system creates a folder specific to you for uploading your response documents. Do not click and attach your documents on collaboration folder. Click on "Tech Bid" the system will allow you to create a document, click "create" button and attach the documents and Financial Proposal on Price Submission Screen). A step-by-step manual/guide is available for downloading using the link https://www.kaa.go.ke/corporate/procurement/manuals
ITT 4.1	Maximum number of members in the Joint Venture (JV) shall be: *2(Two)*
ITT 4.3 g)	would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the project specified in the **TDS ITT 1.1** that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; or

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
ITT 4.9	Where the procurement is implemented across jurisdictional boundaries, then exclusion of a firm or individual on the basis of ITT 4.8 (i) above by any country may be applied to that procurement across other countries involved.
ITT 7	SITE VISIT shall be mandatory
B. Tendering Document	
ITT 8.1	The pre-tender conference and visit of the site of the works **will be held** If it will be held, it will be held on 19th **Februaury 2025 at *10:00am at airport manager's office*** And at **PROJECT SITE: MOI INTERNATIONAL AIRPORT, mombasa, mombasa COUNTY**
ITT 8.2	Any questions in writing, shall reach the Procuring Entity through the email address tenders@kaa.bo.ke three days before tender opening
ITT 8.4	Minutes of the pre-Tender meeting and the pre-arranged pretender visit of the site of the works will be published at the website: www.kaa.go.ke
ITT 9.1	**The Tenderer will submit any request for clarifications in writing at the address:** Attention: ***General Manager, Procurement & Logistics*** Postal Address: ***P.O. Box 19001-00501 Nairobi, Kenya*** Physical Address: ***Kenya Airports Authority Headquarters Complex Building, Jomo Kenyatta International Airport, Airport North Road, 2nd Floor, Procurement & Logistics Department*** Electronic mail address***:*** tenders@kaa.go.ke Request for clarification should be received by the Procuring Entity no later than: three (3) days before closing/opening date.
C. Preparation of Tenders	
ITT 13.1 (j)	The Tenderer shall submit the following additional documents in its Tender: documents as provided in the evaluation and qualifications criteria as specified in Section III.
ITT 15.1	Alternative Tenders ***[insert "shall be" or "shall not be"]*** _____considered.
ITT 15.2	Alternatives to the Time Schedule ***shall not be*** permitted

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
ITT 15.4	Alternative technical solutions shall be permitted for the following parts of the Plant and Installation Services: ***[insert parts of the Plant]*** _____as further detailed in the Specification. If alternative technical solutions are permitted, the evaluation method will be as specified in Section III, Evaluation and Qualification Criteria.
ITT 19.1	Tenderers shall quote for the following components or services on a single responsibility basis: **SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT**
ITT 19.5 (a) and (d)	Place of destination: **DDP to MOI INTERNATIONAL AIRPORT** Final destination (Project Site): **MOI INTERNATIONAL AIRPORT**
ITT 19.6	The Incoterms edition is: ***2022(or Latest Edition)***
ITT 19.7	The prices quoted by the Tenderer ***[insert "shall "or "shall not"]*** _____ be subject to adjustment during the performance of the Contract.
ITT 20.1	The Tenderer ***is*** required to quote in Currency (**KES.) or (USD) or (Euro)** the portion of the Tender price that corresponds to expenditures incurred in that currency
ITT 21.1	The Tender validity period shall be ***186*** days.
ITT 21.3 (a)	The Tender price shall be adjusted by the following factor(s): N/A
ITT 22.1	Tender security shall be **Kshs. 1,500,000.00** and shall be valid for **216 days** from the date of tender opening. Tenderers who have obtained a digital tender security must provide, together with bid, a mechanism to verify the Tender Security such as use of quick response (QR) code or an online portal. The tender security shall be in any of the following forms: a) cash or banker's cheque, or b) a bank guarantee, or c) guarantee issued by a reputable insurance company approved by Public Procurement Regulatory Authority (PPRA) or d) Letter of credit. **Bidders shall be required to submit your original Tender Security/ Bid Bond physically in the office of the General Manager, Procurement and Logistics Department, 2nd Floor KAA Headquarters, JKIA before closing/opening date and time.** **A scanned copy of the same should be submitted online with the tender** **Note: we request if you have printed the Bid Bond and not the Bank to get it**

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
	certified by the Bank before submission.
ITT 23.1	In addition to the original of the Tender, the number of copies is: NOT APPLICABLE. TENDER MUST BE SUBMITTED ONLINE
ITT 23.3	The written confirmation of authorization to sign on behalf of the Tenderer shall consist of: ***Power of Attorney Certified by The Commissioner of Oath***
D. Submission and Opening of Tenders	
ITT 25.1	Completed Tender documents and its attachments must be submitted online before the closing date **27th February 2025 at 11.00 am.** All relevant submission documents must be attached on the login screen (Technical Proposal on C folder under technical Rfx Response system will lead you to the second screen (C folder) where the system creates a folder specific to you for uploading your response documents. Do not click and attach your documents on collaboration folder. Click on "Tech Bid" the system will allow you to create a document, Click "create" button and attach the documents and Financial Proposal on Price Submission Screen). A step by step manual/guide is available for downloading using the link https://www.kaa.go.ke/corporate/procurement/manuals
ITT 28.1	Tenders will be opened online immediately on **27th February 2025 at 11.00 am** at the Conference Room, 1st Floor, Kenya Airports Authority Headquarters complex building. In observing the protocols as provided by the Ministry of Health of the prevention of COVID-19 there shall be no physical attendance of the tender opening. However, a virtual link shall be provided to those tenderers who shall submit their tenders online and would wish to participate in the tender opening. Tenderers shall therefore be required to submit their email address to tenders@kaa.go.ke to enable them access this link during tender opening. Please note that all our tenders shall be submitted electronically except the original tender security which shall submitted to the office of the General Manager (Procurement & Logistics) on or before the closing time which is on **27th February 2025 at 11.00 am.**
ITT 28.6	The Form of Tender and Price Schedules shall not be initialled by representatives of the Procuring Entity conducting Tender opening*. Because it is submitted online*
E. Evaluation, and Comparison of Tenders	
ITT 33.3	The adjustment shall be based on the ***average*** price of the item or component as quoted in other substantially responsive Tenders. If the price of the item or component cannot be derived from the price of other substantially responsive Tenders, the Procuring Entity shall use its best estimate.
ITT 34.2	The error shall be determined as a major deviation if it is more than 5%

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
ITT 35.1	The currency that shall be used for Tender evaluation and comparison purposes to convert (at the selling exchange rate) all Tender prices expressed in various currencies into a single currency is: Kenya shillings **(Kshs)** The source of exchange rate shall be: __ ***the Central Bank in*** Kenya The date for the exchange rate on the date of opening
ITT 36.2	A margin of preference **as provided by the PPADA 2015**
ITT 37.4 (e)	The adjustments shall be determined using the following criteria, from amongst those set out in Section III, Evaluation and Qualification Criteria: ***[refer to Section III, Evaluation and Qualification Criteria; insert complementary details if necessary]*** (a) Deviation in Time for Completion: ***NO*** (b) Life cycle costs: the projected operating and maintenance costs during the life of the goods or equipment***: NO*** (c) Functional Guarantees of the Facilities: ***NO*** (d) Work, services, facilities, etc., to be provided by the Procuring Entity ***NONE***
ITT 37.6	Tenderers shall **be ~~allowed/not allowed~~** (*select one)* to quote separate prices for different lots (contracts) and the methodology to determine the lowest tenderer is specified in Section III, Evaluation and Qualification Criteria.
ITT 45	The Standstill Period is___14____ Business Days after the date the Procuring Entity has transmitted to all Tenderers that submitted a Tender, the Notification of its Intention to Award the Contract to the successful Tenderer
ITT 51	The hourly fee specified **is N/A** plus reimbursable expenses.
ITT 52.1	The procedures for making a Procurement-related Complaint are detailed in the "Notice of Intention to Award the Contract" herein and are also available from the PPRA website ~~info@ppra.go.ke~~ or ~~complaints@ppra.go.ke~~ **For the attention**: **Title/position**: *GENERAL MANAGER, PROCUREMENT & LOGISTICS* **Procuring Entity**: *KENYA AIRPORTS AUTHORITY* **Email address***: ~~tenders@kaa.go.ke~~* In summary, a Procurement-related Complaint may challenge any of the following: **1.** The terms of the Tendering Documents; and **2.** The Procuring Entity's decision to award the contract.

SECTION III - EVALUATION AND QUALIFICATION CRITERIA

1. General Provision

1.2 Wherever a Tenderer is required to state a monetary amount, Tenderers should indicate the Kenya Shilling equivalent using the rate of exchange determined as follows:

a. For construction turn over or financial data required for each year -Exchange rate prevailing on the last day of the respective calendar year (in which the amounts for that year is to be converted) was originally established.

b. Value of single contract -Exchange rate prevailing on the date of the contract signature.

c. Exchange rates shall be taken from the publicly available source identified in the ITT 33.1. Any error in determining the exchange rates in the Tender may be corrected by the Procuring Entity.

1.3 This section contains the criteria that the Procuring Entity shall use to evaluate tender and qualify tenderers. No other factors, methods or criteria shall be used other than specified in this tender document. The Tenderer shall provide all the information requested in the forms included in Section IV, Tendering Forms. The Procuring Entity should use **the Standard Tender Evaluation Report for Goods and Works** for evaluating Tenders.

1.4 **Evaluation and contract award Criteria**

1.5 The Procuring Entity shall use the criteria and methodologies listed in this Section to evaluate tenders and arrive at the Lowest Evaluated Tender. The tender that (i) meets the qualification criteria, (ii) has been determined to be substantially responsive to the Tender Documents, and (iii) is determined to have the Lowest Evaluated Tender price shall be selected for award of contract.

2. Preliminary Examination for Determination of Responsiveness

The Procuring Entity will start by examining all tenders to ensure they meet in all respects the eligibility criteria (including requirements in the qualification forms, tenderer's eligibility- confidential business questionnaire) and other requirements in the ITT and that the tender is complete in all aspects in meeting the requirements of “Part 2 - Procuring Entity's Requirements”, including checking for tenders with unacceptable errors, abnormally low tenders, and abnormally high tenders. The Standard Tender Evaluation Report for Goods and Works provides clear guidelines on how to deal with review of these requirements. Tenders that do not pass the Preliminary Examination will not be considered further.

3. Evaluation

1.6 **Technical Evaluation**

In addition to the criteria listed in ITT 35.2(a) - c) the following factors shall apply:

……
…….. Tenders that fail technical evaluation will not be considered further.

1.7 **Economic Evaluation**

Price evaluation: in addition to the criteria listed in ITT 35.4 (a) – (e) the following criteria shall apply:

i) **Alternative Completion Times, i**f permitted under ITT 13.2, will be evaluated as follows:

……

ii) **Alternative technical solutions for specified parts**

The acceptability of alternative technical solutions for parts of the facilities, if permitted under ITT 13.4, will be determined as follows:

……

……..

iii) **Life Cycle Costs**

[Lifecycle costing should be used when the costs of operation and/ or maintenance over the specified life of the goods or works are estimated to be considerable in comparison with the initial cost and may vary among different Tenders/proposals. It shall be evaluated on a net present value basis. When using lifecycle costing, the Procuring Entity shall specify the following information:]

Since the operating and maintenance costs of the facilities being procured form a major part of the **life cycle cost** of the facilities, these costs will be evaluated according to the principles given here after, including the cost of spare parts for the initial period of operation stated below and based on prices furnished by each Tenderer in Price Schedule Nos. 1 and 2, as well as on past experience of the Procuring Entity or other Procuring Entity's similarly placed. Such costs shall be added to the Tender price for evaluation. The operating and maintenance costs factors for calculation of the life cycle cost are:

i) Number of years for lifecycle*:*_____*[Insert number of years]*

ii) Operating costs *[state how they will be determined]*

iii) Maintenance costs, including the cost of spare parts for the initial period of operation *[state how they will be determined],* and

iv) Discount rate:_____*[insert discount rate in percent]* to be used to discount to present value all annual future costs calculated under (ii) and (iii) above for the period specified in (i).

The price of recommended spare parts quoted in Price Schedule No.6 shall not be considered for evaluation.

iv) **Functional Guarantees of the Facilities**

The minimum (or maximum) requirements stated in the Specification for functional guarantees required in the Specification are:

Functional Guarantee	**Minimum (or Maximum, as appropriate) Requirement**
1.	
2.	
3.	
…	

For the purposes of evaluation, for each percentage point that the functional guarantee of the proposed

Plant and Installation Services is below the norm specified in the Specification and in the above table, but above the minimum acceptable levels also specified there in, an adjustment of will be added to the Tender price. If the drop below the norm or the excess above the minimum acceptable levels is less than one percent, the adjustment will be appropriated accordingly.

vi) Work, services, facilities, etc., to be provided by the Procuring Entity.

Where Tenders include the under taking of work or the provision of services or facilities by the Procuring Entity in excess of the provisions allowed for in the Tendering document, the Procuring Entity shall assess the costs of such additional work, services and/or facilities during the duration of the contract. Such costs shall be added to the Tender price for evaluation.

vii) Specific addition criteria

The relevant evaluation method, if any, shall be as follows: .....

Any adjustments in price that result from the above procedures shall be added, for purposes of comparative evaluation only, to arrive at an "Evaluated Tender Price." Tender prices quoted by Tenderers shall remain unaltered.

4. Multiple Contracts (ITT 35.6)

1.8 Multiple contracts will be permitted in accordance with ITT 35.4. Tenderers are evaluated on basis of Lots and the lowest evaluated tenderer identified for each Lot. The Procuring Entity will select one Option of the two Options listed below for award of Contracts.

OPTION1

i) If a tenderer wins only one Lot, the tenderer will be awarded a contract for that Lot, provided the tenderer meets the Eligibility and Qualification Criteria for that Lot.

ii) If a tenderer wins more than one Lot, the tender will be awarded contracts for all won Lots, provided the tenderer meets the aggregate Eligibility and Qualification Criteria for all the Lots. The tenderer will be awarded the combination of Lots for which the tenderer qualifies and the others will be considered for award to second lowest the tenderers.

OPTION 2

The Procuring Entity will consider all possible combinations of won Lots [contract(s)] and determine the combinations with the lowest evaluated price. Tenders will then be awarded to the Tenderer or Tenderers in the combinations provided the tenderer meets the aggregate Eligibility and Qualification Criteria for all the won Lots.

5. MARGIN OF PREFERENCE

2

2.1 If the **TDS** so specifies, the Procuring Entity will grant a margin of preference of 15% (fifteen percent) to Tenderers offering goods manufactured, mined, extracted, grown, assembled or semi-processed in Kenya. Goods assembled or semi-processed in Kenya shall have a local content of not less than 40%.

2.2 The margin of preference will be applied in accordance with, and subject to, the following

provisions:

a Tenderers applying for such preference on goods offered shall be asked to provide, as part of the data for qualification, such information, including details of the goods produced in Kenya, so as to determine whether, according to the classification established by the Procuring Entity, a particular category of goods or group of goods qualifies for a margin of preference.

b After Tenders have been received and reviewed by the Procuring Entity, goods offered in the responsive Tenders shall be assessed to ascertain they are manufactured, mined, extracted, grown, assembled or semi-processed in Kenya. Responsive tenders shall be classified in to the following groups:

i) **Group A:** Tenders offering goods manufactured in Kenya, for which (a) labour, raw materials, and components from within Kenya account for more than forty (40) percent of the Ex-Works price; and the production facility in which they will be manufactured or assembled has been engaged in manufacturing or assembling such goods at least since the date of Tender submission date;

ii) **Group B:** All other Tenders offering Goods manufactured in Kenya;

iii) **Group C:** Tenders offering Goods manufactured outside Kenya that have been already imported or that will be imported.

2.3 To facilitate this classification by the Procuring Entity, the tenderer shall complete whichever version of the Price Schedule furnished in the Tendering document is appropriate, provided however, that the completion of an in correct version of the Price Schedule by the Tenderer shall not result in rejection of its Tender, but merely in the Procuring Entity's reclassification of the Tender into its appropriate Tender group.

2.4 The Tenders in each group will then be compared to determine the Tender with the lowest evaluated cost in that group. The lowest evaluated cost Tender from each group shall then be compared with each other and if as a result of this comparison a Tender from Group A or Group B is the lowest, it shall be selected for the award.

2.5 If as a result of the preceding comparison, a Tender from Group C is the lowest evaluated cost, an amount equal to or 15% of the respective tender price, including unconditional discounts and excluding provisional sums, if any, shall be added to the evaluated price offered in each tender from Group C. If the tender from Group C is still the lowest tender, it shall be selected for award. If not, the lowest evaluated tender from Group A or B based on the first evaluation price shall be selected.

6. Alternative Tenders (ITT 13.1)

An alternative if permitted under ITT 13.1, will be evaluated as follows:

The Procuring Entity shall consider Tenders offered for alternatives as specified in Part 2- Procuring Entity's requirements. Only the technical alternatives, if any, of the Tenderer with the Best Evaluated Tender conforming to the basic technical requirements shall be considered by the Procuring Entity.

7. Post qualification and Contract award (ITT 39), more specifically,

a) In case the tender was subject to post-qualification, the contract shall be awarded to the lowest

evaluated tenderer, subject to confirmation of prequalification data, if so required.

b) In case the tender was not subject to post-qualification, the tender that has been determined to be the lowest evaluated tenderer shall be considered for contract award, subject to meeting each of the following conditions.

i) The Tenderer shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow of Kenya Shillings_____

ii) Minimum ~~average~~ annual construction turnover of Kenya Shillings *[insert amount]*, equivalent calculated as total certified payments received for contracts in progress and/ or completed within the last *[insert of year]* years.

iii) At least__(*insert number)* of contract (s) of a similar nature executed within Kenya, or the East African Community or abroad, that have been satisfactorily and substantially completed as a prime contractor, or joint venture member or sub-contractor each of minimum value Kenya shillings _____equivalent.

iv) Contractor's Representative and Key Personnel, which are specified as

v) Contractors' key equipment listed on the table "Contractor's Equipment" below and more specifically listed as *[specify requirements for each lot as applicable]*

iv) Other conditions depending on their seriousness.

a) History of non-performing contracts:

Tenderer and each member of JV in case the Tenderer is a JV, shall demonstrate that non-performance of a contract did not occur because of the default of the Tenderer, or the member of a JV in the last _____(*specify years*). The required information shall be furnished in the appropriate form.

b) Pending Litigation

Financial position and prospective long-term profitability of the Single Tenderer, and in the case the Tenderer is a JV, of each member of the JV, shall remain sound according to criteria established with respect to Financial Capability under Paragraph (i) above i fall pending litigation will be resolved against the Tenderer. Tenderer shall provide information on pending litigations in the appropriate form.

c) Litigation History

There shall be no consistent history of court/ arbitral award decisions against the Tenderer, in the last _____(*specify years*). All parties to the contract shall furnish the information in the appropriate form about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the years specified. A consistent history of awards against the Tenderer or any member of a JV may result in rejection of the tender.

8. Qualification

Factor		1. Eligibility and Preliminary Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All member combined	Each Partner	At least one Partner	
1.1	**Nationality**	Nationality in accordance with ITT 4.6.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Form ELI –1.1 and 1.2, with attachments
1.2	**Conflict of Interest**	No- conflicts of interests as described in ITT 4.3	Must meet requirement	must meet requirement	Must meet requirement	N / A	Form of Tender
1.3	**PPRA Ineligibility (if Debarred/Sanctioned)**	Not having been declared ineligible by the PPRA as described in 4.5.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Form of Tender
1.4	**State Owned Enterprise or Institution**	Compliance with conditions of ITT 4.8	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Form ELI –1.1 and 1.2, with attachments
1.5	**Ineligibility based on a United Nations resolution or Kenya laws**	Not having been excluded as a result of the Kenya laws or official regulations, or by an act of compliance with UN Security Council resolution, in accordance with ITT 4.9 and Section V.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Form of Tender
1.6	**Tax Obligations for Kenyan Tenderers**	Has produced a current tax clearance certificate or tax exemption certificate issued by the Kenya Revenue Authority in accordance with ITT 4.13.A valid KRA tax	Must meet requirement	must meet requirement	Must meet requirement	N / A	Attach Tax Compliance Certificate

Factor		1. Eligibility and Preliminary Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All member combined	Each Partner	At least one Partner	
		compliance certificate or its equivalent in their country of origin.					
1.7	**Form of Tender**	Duly filled, signed and stamped form of tender	Must meet requirement	must meet requirement			Form of Tender
1.8	**Bid Security**	Tender security shall be **KES. 1,200,000.00** and shall be valid for **156 days** from the date of tender opening. Tenderers who have obtained a digital tender security must provide together with bid, a mechanism to verify the Tender Security such as use of **quick response (QR) code** or an online portal. The tender security shall be in any of the following forms: a) cash or banker's cheque, or b) a bank guarantee, or c) Guarantee issued by a reputable insurance company approved by Public Procurement Regulatory Authority (PPRA).	Must meet requirement	must meet requirement			Form of tender security -Demand Bank Guarantee

Factor		1. Eligibility and Preliminary Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All member combined	Each Partner	At least one Partner	
1.9	**Registration**	Copy of certificate of Registration/Incorporation or partnership deed to show that the applicant is a registered company and legally authorized to do business in Kenya.	Must meet requirement		Must meet requirement		Attach Certificate of Registration/Incorporation
1.10	**Business Permit**	Valid Trade License/Business permit in the county of operation.	Must meet requirement		Must meet requirement		Attach Valid Trade License/Business permit
1.11	**Power Of Attorney**	A written Power of Attorney authorizing the signatory of the tender to commit the Tenderer certified by a commissioner for oath. This requirement is not applicable to sole proprietorships.	Must meet requirement	Must meet requirement			Attach Power of Attorney
1.12	**Serialization**	Tender Document to be sequentially serialized from the first to the last page including all the attachments in numerical digits' format. All blank pages must clearly marked "BLANK".	Must meet requirement	Must meet requirement			Serialize All Pages
1.13	**Confidential Business Questionnaire**	Duly filled and signed Confidential Business Questionnaire form in the format provided in the tender document	Must meet requirement		Must meet requirement		Confidential Business Questionnaire Form

Factor		1. Eligibility and Preliminary Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All member combined	Each Partner	At least one Partner	
1.14	**Certificate of Independent Tender Determination**	Duly filled Certificate of Independent Tender Determination	Must meet requirement		Must meet requirement		Certificate of Independent Tender Determination
1.15	**Self-Declaration Forms**	a) Duly filled self-Declaration that the Person/Tenderer is not Debarred in the Matter of the Public Procurement and Asset Disposal Act 2015.	Must meet requirement		Must meet requirement		Form SD1
1.16	**Self-Declaration Forms**	b) Duly filled Self Declaration that the Person/Tenderer will not engage in any corrupt or fraudulent practice.	Must meet requirement		Must meet requirement		Form SD2
1.17	**Code of Ethics**	c) Duly filled Declaration and commitment to the Code of Ethics	Must meet requirement		Must meet requirement		Form Declaration and Commitment to the Code of Ethics
1.18	**Price Schedule**	Submission of a dully filled, signed and stamped price schedule form.	Must meet requirement				Attach Filled Schedule of Rates and Prices

Factor		1. Eligibility and Preliminary Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All member combined	Each Partner	At least one Partner	
1.19	**Shareholder of the Company**	Copy of CR 12. Where one or more of the shareholders is a Company (Beneficial Ownership) the CR12 of such a company shall be provided. This requirement is not applicable to sole proprietorships and partnerships. However, where the CR12 of the beneficial shareholders is not available, as at the time of the tender submission, the successful bidder shall be required to submit it before execution of the contract. This requirement is not applicable to sole proprietorships and partnerships registered under Business Names. Provide copy of CR12 or equivalent from country of origin (in case of joint venture with a foreign company), providing a list of directors and shareholding status.	Must meet requirement	Must meet requirement			Attach CR12/ or Equivalent of Country of Origin
1.20	**EPRA**	Submission of valid EPRA License (Company's Valid EPRA license A1 – Electrical contractor)	Must meet requirement			Must meet requirement	Attach Valid EPRA license
1.21	**NCA**	Submission of valid NCA Registration certificate and a valid practising license that fall within categories	Must meet requirement			Must meet requirement	Attach valid NCA registration Certificate and valid license

Factor		1. Eligibility and Preliminary Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All member combined	Each Partner	At least one Partner	
		NCA 1 – electrical services installations ; at least NCA 1 or 2 for civil works or building works					
1.22	**Engagement with the KAA**	Have you ever been contracted by KAA? State Yes/No If you have ever been contracted by KAA and i) performed poorly in contract(s)/or been terminated in contract(s) you need not apply; the bids will not be considered ii) have two (2) ongoing projects you need not apply, the bids will not be considered. .	Must meet requirement		Must meet requirement		Bidder must provide written document on bidder's letter head addressed to MD/CEO Kenya Airports Authority confirming the same
1.23	**Site Visit**	Attendance of site visit by technical staff of the bidder who will be part of the project implementation team submitted as key personnel. The bidder is required to submit the site attendance sheet signed by KAA staff/ representative at the site meeting. – Electrical engineer & Civil Engineer	Must meet requirement	Must meet requirement			Attach signed/ stamped site visit attendance sheet

Factor	2. Historical Contract Non-Performance and Performance					
Sub-Factor	Criteria					Documentation Required
	Requirement	Tenderer				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
2.1 History of non-performing contracts	Non-performance [1] of a contract did not occur within the last _____ (_) years prior to the deadline for application submission, based on all information on fully settled disputes or litigation. A fully settled dispute or litigation is one that has been resolved in accordance with the Dispute Resolution Mechanism under the respective contract, and where all appeal instances available to the Tenderer have been exhausted.	Must meet requirement by itself or as member to past or existing JV	N / A	Must meet requirement[2]	N / A	Form CON - 2
2.2 Suspension	Not under suspension based on execution of a Tender Securing Declaration or Proposal Securing Declaration pursuant to ITT 4.7 and ITT 20.9	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement	Form of Tender
2.2 Pending Litigation	Tender's financial position and prospective long-term profitability still sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Tenderer	Must meet requirement	N / A	Must meet requirement	N / A	Form CON – 2
2.3 Litigation History	No consistent history of court/arbitral award decisions against the Tenderer[3] since 1st January [insert year]	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2

1 Nonperformance, as decided by the Procuring Entity, shall include all contracts where (a) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Nonperformance shall not include contracts where Procuring Entitys decision was overruled by the dispute resolution mechanism. Nonperformance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Tenderer have been exhausted.

2 This requirement also applies to contracts executed by the Tenderer as JV member.

3 The Tenderer shall provide accurate information on the related Tender Form about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent

2.4 Contract Commitment	Indicate the current ongoing contracts and commitments on work in progress [insert year]	Must meet requirement		Must meet requirement		Form CCC

history of awards against the Tenderer or any member of a joint venture may result in failure of the Tender.

Factor	3 Financial Situation					
Sub-Factor	Criteria					Documentation Required
	Requirement	Tenderer				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
3.1 Financial Capabilities	Submission of audited financial statements incorporating balance sheets (statements of financial position), profit and loss statements (statements of comprehensive income) and cash flow statements for any of the last 3 years (2019-2021) or (2020-2022) prepared in accordance with International Financial Reporting Standards and incorporating audit opinions issued in accordance with ICPAK By-Law No. 38. to demonstrate the current soundness of the Tenderers financial position and its prospective long-term profitability	Must meet requirement	N / A	Must meet requirement	N / A	Form FIN – 3.1 with attachments
3.2 Average Annual Turnover	Minimum average annual turnover in Construction [insert the appropriate sector] of electrical substations not less than KES 300 million(calculated as total certified payments received for contracts in progress or completed, within the last_3 years) as demonstrated by copies of audited financial statements incorporating balance sheets (statements of financial position), profit and loss statements (statements of comprehensive income) and cash flow statements for any of the last 3 years (2019-2021) or (2020- 2022) prepared in accordance with International Financial Reporting Standards and incorporating audit opinions issued in accordance with ICPAK By-Law No. 38	Must meet requirement	Must meet requirement	Must meet_____ percent (_____%) of the requirement	Must meet_____ percent (_____%) of the requirement	Form FIN –3.2

3.3 Financial Resources	Copies of the following documents as proof of access to liquid assets of not less than KES. 300Million or capacity to have a minimum cash flow of KES. 300million This shall be evidenced by any of the following: a) Overdraft facility from a commercial bank specifically for indicating the amount to be availed or b) Current bank statement for the last twelve months (Three months before close of tender is acceptable) or c) A combination of the above	Must meet requirement	Must meet requirement	Must meet_____ percent (_____%) of the requirement	Must meet_____ percent (_____%) of the requirement	Form FIN –3.3 Bank Overdraft Bank Statement not more than 12 Months old

Factor	4 Experience					
Sub-Factor	Criteria					Documentation Required
	Requirement	Tenderer				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
4.1 General Experience	Experience in construction works under contracts in the role of main contractor for at least the last Five (5) years starting 1st January of (2017-2022 or 2018-2023 or 2019-2024]. Value of the works should be an average of KES 300,000,000.00	Must meet requirement	N / A	Must meet requirement	N / A	Form EXP-4.1 Evidenced by Contracts or LPOs supported by. •Copy of Defects Liability Certificates; or •Copy of completion certificate; or •Interim payment certificate of not less than 70% value of the contract;
4.2(a)Specific Experience	(a)Participation as contractor, joint venture member[4] in at least _5__(Five) similar Contract of 33KV and above substation construction contracts within five (_5__) years (starting 1st January 2017-2022 or 2018-2023 or 2019-2024), each with a value of at least Valued at Average Minimum of KES 300,000,000, that have been successfully and substantially[5] completed and that are similar to the proposed Plant and Installation Services. The similarity of the contracts shall be based on the following: [*Based on Section VII, Scope of Works, specify the minimum key requirements in terms of physical size, complexity, construction method, technology and/or other characteristics. Indicate, if any, of this key*	Must meet requirement	Must Meet requirement [6]	N / A	Must meet the following requirements for the key activities listed below [list key activities and the corresponding minimum requirements to be met by	Form EXP 4.2(a) Evidenced by Contracts or LPOs supported by •Copy of Defects Liability Certificates; or •Copy of completion certificate; or •Interim payment certificate of not less than 70% value of the contract;

4 For contracts under which the Tenderer participated as a joint venture member or sub-contractor, only the Tenderer's share, by value, shall be considered to meet this requirement

5 Substantial completion shall be based on 80% or more plant and installation completed under the contract.

6 In the case of JV, the value of contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single contract has been met. Instead, each contract performed by each member shall satisfy the minimum value of a single contract as required for single entity. In determining whether the JV meets the requirement of total number of contracts, only the number of contracts completed by all members each of value equal or more than the minimum value required shall be aggregated.

Factor	4 Experience					
Sub-Factor	Criteria					Documentation Required
	Requirement	Tenderer				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
	requirement may also be met through a specialized subcontractor.]				one member otherwise state: "N/A"]	For subcontracted works, the bidder should provide the following; •Award letter of the main contractor •Award letter of the subcontract •Completion letter of the subcontract •Subcontract approval from the Engineer/ supervision Authority *All submitted Documents **Shall** be verified from the issuing agencies, KAA reserves the right to verify all submitted documents*
4.2(b) Specific Experience	(b) For the above or other contracts executed during the period stipulated in 4.2(a) above, a minimum experience in the following key activities: electrical power distribution substation rated at 33KV/11KV	Must meet requirements	Must meet requirements [7]	N / A	Must meet the following requirements for key activities listed	Form EXP-4.2(b) Evidenced by Contracts or LPOs supported by

7 In the case of JV, the value of contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single contract has been met. Instead, each contract performed by each member shall satisfy the minimum value of a single contract as required for single entity. In determining whether the JV meets the requirement of total number of contracts, only the number of contracts completed by all members each of value equal or more than the minimum value required shall be aggregated.

Factor	4 Experience					
Sub-Factor	Criteria					Documentation Required
	Requirement	Tenderer				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
					below [if applicable, out of the key activities in the first column of this 4.2 b), list key activities (volume, number or rate of production as applicable) and the corresponding minimum requirements that have to be met by one member, otherwise this cell should state: "N/A".]	•Copy of Defects Liability Certificates; or •Copy of completion certificate; or •Interim payment certificate of not less than 70% value of the contract; For subcontracted works, the bidder should provide the following; •Award letter of the main contractor •Award letter of the subcontract •Completion letter of the subcontract •Subcontract approval from the Engineer/ supervision Authority All submitted Documents Shall be verified from the issuing agencies, KAA reserves the right to verify all submitted documents

Note: [For Multiple lots (contracts) specify financial and experience criteria for each lot under Sub-Factors 3.1, 3.2, 4.2(a) and 4.2(b)]

Factor		5. tTechnical Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All members combined	Each member	At least one member	
5.1	**Technical Compliance Table / Guaranteed Technical Specification table**	This is a mandatory fulfilment. the bidder shall be required to duly fill the technical compliance table / Guaranteed Technical Specification's table provided with the technical specifications of the listed equipment - (statement such as 'comply/ complied' where exact values are required of a particular equipment will be considered non- responsive) and a bidder who fails on any of the critical parameters shall be deemed non-responsive. Only one catalogue/brochure shall be submitted for the specification of each equipment. Bids with more than one brochure/catalogue pertaining the technical specifications for each equipment will be considered non- responsive. The key equipment here in are **transformers, switchgear, isolators and insulators**	Must meet requirement	Must meet requirement	N / A	N / A	Dully filled compliance table or guaranteed technical specifications
5.2	**Manufacture's Authorization & Warranty**	The tenderer SHALL submit Manufacturers Authorizations & Warranty Form on Manufacturer's letterhead signed and stamped. –(for the key equipment- **transformers, switchgear, isolators and insulators)**	Must meet requirement	Must meet requirement	N / A	N / A	Manufacturer's Authorization and Warranty in the format provided
5.3	**ISO14001:2015**	Submission of Manufacturer's ISO 14001:2015 certificate OR NEMA license for key equipment –*(list the equipment that require manufacture's ISO 14001:2015*)	Must meet requirement	Must meet requirement	N / A	N / A	Manufacturer's ISO 14001:2015
5.4	**ISO9001:2015**	Submission of Manufacturer's ISO9001:2015 certificate for quality Management OR KEBS certification for the key equipment i.e. *(list the equipment that require manufacture's ISO 9001;:2015)*	Must meet requirement	Must meet requirement	N / A	N / A	Manufacturer's ISO 9001:2015

Factor		5. tTechnical Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All members combined	Each member	At least one member	
5.5	**Contractors Personnel**	Qualifications and technical experience of site personnel to manage and execute the works on the site. (1) Project Team Lead- One, The Project Supervisor shall have at least a degree in Electrical Engineering and Registered with EBK as a professional engineer and with at least Fifteen (15) years of experience in substation works. (2) Project Engineers -2No. (1No. Electrical Engineer & 1No. Civil Engineer), The Project Engineer shall have at least a degree in Electrical Engineering and Registered with EBK as a professional engineer and with at least ten (10) years of experience. (3) Technicians. 3No. (2- 2No. Electrical Engineer & 1No. Civil Engineer),	Must meet requirements	Must meet requirement	N / A	N / A	Form PER-1 and Form PER-2

Factor		5. tTechnical Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All members combined	Each member	At least one member	
		The technicians shall have at least a Diploma in Civil Engineering & Electrical Engineering with a minimum of ten (10) years of experience. (4) Health and Safety Office - 1No. The officer shall have at least a certificate in Health and Safety with a minimum of Ten (10) years of experience. This shall be evidenced by ● Signed CV's by both the nominee and the employer ● Academic Certificates Certified by Commissioner of Oath At least one of the above staff members must have an EPRA license minimum A1 -Option Electrical technician. The documents provided here shall be for the staff proposed in Form PER -1- and PER2 for Proposed Personnel.					

Factor		5. tTechnical Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All members combined	Each member	At least one member	
		The personnel in the proposed roles must provide a written undertaking signed by the nominee confirming his/her availability to carry out the assignment upon winning the bid. The written undertaking shall be addressed to MD/CEO Kenya Airports Authority and must be specific to this tender					
5.6	**Site Organization**	The tenderer SHALL provide a proposed site organisation chart for the proposed project while including the names of the personnel whose CV and certificates have been provided for the project personnel- PER1 and PER2	Must meet requirement	Must meet requirement	N / A	N / A	Site Organization
5.7	**Method statement /Methodology**	The tenderer SHALL provide a proposed method statement or methodology on how s/he proposed to implement the work to the required standard 1.Procedure execution of activities as outlined in Bill of Quantities or schedule of rates 2.Allocation machinery/labour execution activities 3.Procedures in quality control of the activities described in Bills of Quantities or schedule of rates	Must meet requirement	Must meet requirement	N / A	N / A	Method statement /Methodology
5.8	**Mobilization schedule and Construction Schedule**	The tenderer SHALL provide a proposed mobilization and construction schedules on how s/he proposes to implement the work to the required standard and within the specified timeline either in Gnatt Chart or any other	Must meet requirements	Must meet requirement	N / A	N / A	Mobilization schedule and Construction Schedule

Factor		5. tTechnical Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All members combined	Each member	At least one member	
		suitable format that indicates the time and schedule of the activities outlined in the proposed methodology; indicating the allocation of personnel, and equipment, further should indicate monthly outputs of each activity					
5.9	**Contractors Equipment**	The tenderer SHALL provide evidence of available equipment and tools to execute the work (list *the equipment required for project implementation)* The tenderer shall have the following relevant tools and equipment whether owned (proof of ownership shall be in form of serial number /receipt) or leased with evidence of valid lease/hire agreements	Must meet requirements	Must meet requirement	N / A	N / A	Form EQUIP
5.10	**Proposed Sub contractor's**	(b) For the above or other contracts executed during the period stipulated in 4.2(a) above, a minimum experience in the following key activities: …. [Indicate, if any, of this key requirement may also be met through a specialized subcontractor.]	Must meet requirements	Must meet requirement	N / A	N / A	List of proposed subcontractors
5.11	**Registration of workplace certificate**	Confirmation of Business Premise/workshops with OSHA. Registration of workplace certificate.	Must meet requirement		Must meet requirement		Registration of workplace certificate
5.12	**Quality Management plan**	Provided a specific Quality management plan 1. Scope Management 2. Time Management 3. Material Quality Management	Must meet requirement	Must meet requirement			QMS plan

Factor		5. tTechnical Evaluation					
Sub-Factor		Criteria					Documentation Required
		Requirement	Tenderer				
			Single Entity	Joint Venture (existing or intended)			
				All members combined	Each member	At least one member	
		4. Financial Management 5. Risk Management 6. Health & Safety Management 7. Environmental Management 8. Communication Management 9. Procurement Management 10. Human Resource Management					
5.13	**Health and Safety Plan**	Provided a Methodology on safety during the construction period: 1. Personal protective equipment 2. Signages 3. Safety procedures					

9. Personnel

The Tenderer must demonstrate that it will have the personnel for the key positions that meet the following requirements:

No.	Position	Total Work Similar Experience (years)	In Similar Works Experience (years)
1	Team Lead – Electrical Engineer	20	15
2	Project Engineer – Electrical	12	10
3	Project Engineer – Civil / Structural	12	10
…	Project Technicians – Electrical and Civil/ and Buildings	10	5

The Tenderer shall provide details of the proposed personnel and their experience records in the relevant Forms included in Section IV, Tendering Forms.

10. Equipment

The Tenderer must demonstrate that it will have access to the key Contractor's equipment listed hereafter:

No.	Equipment Type and Characteristics	Minimum Number required
1	Truck with crane	1
2	Electrical tool box	3
3	Electrical measuring tools	5
…	Protective gears	15

The Tenderer shall provide further details of proposed items of equipment using the relevant Form in Section IV.

11. Subcontractors

Subcontractors/ manufacturers for the following major items of supply or services ('Specialized

Subcontractors') must meet the following minimum criteria, here in listed for that item:

Item No.	Description of Item	Minimum Criteria to be met
1		
2		
3		
…		

Failure to comply with this requirement will result in rejection of the subcontractor.

In the case of a Tenderer who offers to supply and install major items of supply under the contract that the Tenderer did not manufacture or otherwise produce, the Tenderer shall provide the manufacturer's authorization, using the form provided in Section IV, showing that the Tenderer has been duly authorized by the manufacturer or producer of the related plant and equipment or component to supply and install that item, Kenya. The Tenderer is responsible for ensuring that the manufacturer or producer complies with the requirements of ITT 4 and 5 and meets the minimum criteria listed above for that item.

SECTION IV - TENDERING FORMS

FORM OF TENDER

(Amended and issued pursuant to PPRA CIRCULAR No. 02/2022)

INSTRUCTIONS TO TENDERERS

i) All italicized text is to help the Tenderer in preparing this form.

ii) The Tenderer must prepare this Form of Tender on stationery with its letterhead clearly showing the Tenderer's complete name and business address. Tenderers are reminded that this is a mandatory requirement.

iii) Tenderer must complete and sign CERTIFICATE OF INDEPENDENT TENDER DETERMINATION and the SELF DECLARATION FORMS OF THE TENDERER as listed under (s) below.

Date of this Tender submission: ..... *[insert date (as day, month and year) of Tender submission]*

Tender Name and Identification: SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT - KAA/OT/MIA/0087/2024-2025

Alternative No.: .....*[insert identification No if this is a Tender for an alternative]*

To: ..... *[Insert complete name of Procuring Entity]*

a) **No reservations:** We have examined and have no reservations to the Tendering document, including Addenda issued in accordance with ITT 8;

b) **Eligibility:** We meet the eligibility requirements and have no conflict of interest in accordance with ITT 4;

c) **Tender-Securing Declaration:** We have not been suspended nor declared ineligible by the Procuring Entity based on execution of a Tender Securing Declaration or Proposal-Securing Declaration in Kenya in accordance with ITT 4.7;

d) **Conformity**: We offer to provide design, supply and installation services in conformity with the Tendering document of the following: *[insert a brief description of the Plant, Design, Supply and Installation Services];*

e) **Tender Price:** The total price of our Tender, excluding any discounts offered in item (f) below is: *[Insert one of the options below as appropriate]*

Option1, in case of one lot: Total price is: *[insert the total price of the Tender in words and figures, indicating the various amounts and the respective currencies];*

Or

Option 2, in case of multiple lots: (a) Total price of each lot [insert the total price of each lot in words and figures, indicating the various amounts and the respective currencies]; and (b) Total price of all lots (sum of all lots) *[insert the total price of all lots in words and figures, indicating the various amounts*

and the respective currencies];

f) **Discounts:** The discounts offered and the methodology for their application are:

i) The discounts offered are: *[Specify in detail each discount offered.]*

ii) The exact method of calculations to determine the net price after application of discounts is shown below:

[Specify in detail the method that shall be used to apply the discounts];

g) **Tender Validity Period:** Our Tender shall be valid for the period specified in TDS 19.1 (as amended if applicable) from the date fixed for the Tender submission deadline specified in TDS 23.1 (as amended if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

h) **Performance Security:** I four Tender is accepted; we commit to obtain a Performance Security in accordance with the Tendering document;

i) **One Tender Per Tenderer:** We are not submitting any other Tender (s) as an individual Tenderer, and we are not participating in any other Tender (s) as a Joint Venture member, and meet the requirements of ITT 4.3, other than alternative Tenders submitted in accordance with ITT 13;

j) **Suspension and Debarment:** We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension. Further, we are not ineligible under the Kenya laws or official regulations or pursuant to a decision of the United Nations Security Council;

k) **State-owned enterprise or institution:** *[select the appropriate option and delete the other]* [We are not a state- owned enterprise or institution]/ [We are a state-owned enterprise or institution but meet the requirements of ITT 4.6];

l) **Commissions, gratuities and fees:** We have paid, or will pay the following commissions, gratuities, or fees with respect to the Tendering process or execution of the Contract: [insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity]

Name of Recipient	**Address**	**Reason**	**Amount**

(If none has been paid or is to be paid, indicate "none.")

m) Binding Contract: We understand that this Tender, together with your written acceptance thereof

included in your Form of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;

n) Not Bound to Accept: We understand that you are not bound to accept the lowest evaluated cost Tender, the Best Evaluated Tender or any other Tender that you may receive; and

o) Fraud and Corruption: We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf engages in any type of Fraud and Corruption.

p) Collusive practices: We hereby certify and confirm that the tender is genuine, non-collusive and made with the intention of accepting the contract if awarded. To this effect we have signed the "Certificate of Independent Tender Determination" attached below.

q) Code of Ethical Conduct: We undertake to adhere by the Code of Ethical Conduct for Persons Participating in Public Procurement and Asset Disposal Activities in Kenya, copy available from www.pppra.go.ke during the procurement process and the execution of any resulting contract.

r) **Beneficial Ownership Information:** We commit to provide to the procuring entity the Beneficial Ownership Information in conformity with the Beneficial Ownership Disclosure Form upon receipt of notification of intention to enter into a contract in the event we are the successful tenderer in this subject procurement proceeding.

s) We, the Tenderer, have duly completed, signed and stamped the following Forms as part of our Tender:

(i) Tenderer's Eligibility; Confidential Business Questionnaire – to establish we are not in any conflict to interest.

(ii) Certificate of Independent Tender Determination – to declare that we completed the tender without colluding with other tenderers.

(iii) Self-Declaration of the Tenderer – to declare that we will, if awarded a contract, not engage in any form of fraud and corruption.

(iv) declaration and commitment to the code of ethics for Persons Participating in Public Procurement and Asset Disposal Activities in Kenya,

t) Further, we confirm that we have read and understood the full content and scope of fraud and corruption as informed in **"Appendix 1- Fraud and Corruption**" attached to the Form of Tender.

Name of the Tenderer: *[*insert complete name of person signing the Tender*]

Name of the person duly authorized to sign the Tender on behalf of the Tenderer: **[*insert complete name of person duly authorized to sign the Tender*]

Title of the person signing the Tender: [*insert complete title of the person signing the Tender*]

Signature of the person named above: [*insert signature of person whose name and capacity are shown above*]

Date signed [*insert date of signing*] **day of** [*insert month*], [*insert year*].

TENDERER'S ELIGIBILITY - CONFIDENTIAL BUSINESS QUESTIONNAIRE

Instruction to Tenderer

Tender is instructed to complete the particulars required in this Form, one form for each entity if Tender is a JV. Tenderer is further reminded that it is an offence to give false information on this Form.Tenderer's details

	ITEM	**DESCRIPTION**
1	Name of the Procuring Entity	KENYA AIRPORTS AUTHORITY
2	Reference Number of the Tender	KAA/OT/MIA/0087/2024-2025
3	Date and Time of Tender Opening	
4	Name of the Tenderer	
5	Full Address and Contact Details of the Tenderer.	1. Country 2. City 3. Location 4. Building 5. Floor 6. Postal Address 7. Name and email of contact person.
6	Current Trade License Registration Number and Expiring date	
7	Name, country and full address (*postal and physical addresses, email, and telephone number*) of Registering Body/Agency	
8	Description of Nature of Business	
9	Maximum value of business which the Tenderer handles.	
10	State if Tenders Company is listed in stock exchange, give name and full address (*postal and physical addresses, email, and telephone number*) of state which stock exchange	

General and Specific Details

a) Sole Proprietor, provide the following details.

Name in full_____

Age____

Nationality_____

Country of Origin_____

Citizenship

b) Partnership, provide the following details.

	Names of Partners	**Nationality**	**Citizenship**	**% Shares owned**
1				
2				
3				

c) Registered Company, provide the following details.

i) Private or public Company

ii) State the nominal and issued capital of the Company: -

iii) Nominal Kenya Shillings (Equivalent)

iv) Issued Kenya Shillings (Equivalent)

v) Give details of Directors as follows.

	Names of Director	Nationality	Citizenship	% Shares owned
1				
2				
3				

d) DISCLOSURE OF INTEREST-Interest of the Firm in the Procuring Entity.

i) Are there any person/ persons in.....(Name of Procuring Entity)

who has/ have an interest or relationship in this firm?

Yes/No..... If yes, provide details as follows.

	Names of Person	Designation in the Procuring Entity	Interest or Relationship with Tenderer
1			
2			
3			

ii) Conflict of interest disclosure

	Type of Conflict	Disclosure YES OR NO	If YES provide details of the relationship with Tenderer
1	Tenderer is directly or indirectly controls, is controlled by or is under common control with another tenderer.		
2	Tenderer receives or has received any direct or indirect subsidy from another tenderer.		
3	Tenderer has the same legal representative as another tenderer		
4	Tender has a relationship with another tenderer, directly or through common third parties, that puts it in a position to influence the tender of another tenderer, or influence the decisions of the Procuring Entity regarding this tendering process.		
5	Any of the Tenderer's affiliates participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the tender.		
6	Tenderer would be providing goods, works, non-consulting services or consulting services during implementation of the contract specified in this Tender Document.		
7	Tenderer has a close business or family relationship with a professional staff of the Procuring Entity who are directly or indirectly involved in the preparation of the Tender document or specifications of the Contract, and/or the Tender evaluation process of such contract.		
8	Tenderer has a close business or family relationship with a professional staff of the Procuring Entity who would be involved in the implementation or supervision of the such Contract.		
9	Has the conflict stemming from such relationship stated in item 7 and 8 above been resolved in a manner acceptable to the Procuring Entity throughout the tendering process and execution of the Contract.		

e) Certification

On behalf of the Tenderer, I certify that the information given above is complete, current and accurate as at the date of submission.

Full Name Title or Designation

(Signature) (Date)

CERTIFICATE OF INDEPENDENT TENDER DETERMINATION

I, the under signed, in submitting the accompanying Letter of Tender to the~~Kenya Airports Authority~~ *[Name of Procuring Entity]* for:SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT

[Name and number of tender] in response to the request for tenders made by:
[Name of Tenderer] do here by make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of *[Name of Tenderer]* that:

1. I have read and I understand the contents of this Certificate;

2. I understand that the Tender will be disqualified if this Certificate is found not to be true and complete in every respect;

3. I am the authorized representative of the Tenderer with authority to sign this Certificate, and to submit the Tender on behalf of the Tenderer;

4. For the purposes of this Certificate and the Tender, I understand that the word "competitor" shall include any individual or organization, other than the Tenderer, whether or not affiliated with the Tenderer, who:

a) Has been requested to submit a Tender in response to this request for tenders;

b) could potentially submit a tender in response to this request for tenders, based on their qualifications, abilities or experience;

5. The Tenderer discloses that [check one of the following, as applicable]:

a) The Tenderer has arrived at the Tender independently from, and without consultation, communication, agreement or arrangement with, any competitor;

b) The Tenderer has entered into consultations, communications, agreements or arrangements with one or more competitors regarding this request for tenders, and the Tenderer discloses, in the attached document(s), complete details thereof, including the names of the competitors and the nature of, and reasons for, such consultations, communications, agreements or arrangements;

6. In particular, without limiting the generality of paragraphs (5) (a) or (5) (b) above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:

a) prices;

b) methods, factors or formulas used to calculate prices;

c) the intention or decision to submit, or not to submit, a tender; or

d) the submission of a tender which does not meet the specifications of the request for Tenders; except as specifically disclosed pursuant to paragraph (5) (b) above;

7. In addition, there has been no consultation, communication, agreement or arrangement with any competitor regarding the quality, quantity, specifications or delivery particulars of the works or services

to which this request for tenders relates, except as specifically authorized by the procuring authority or as specifically disclosed pursuant to paragraph (5) (b) above;

8. The terms of the Tender have not been, and will not be, knowingly disclosed by the Tenderer, directly or indirectly, to any competitor, prior to the date and time of the official tender opening, or of the awarding of the Contract, whichever comes first, unless otherwise required by law or as specifically disclosed pursuant to paragraph (5) (b) above.

Name__

Title__

Date__

[Name, title and signature of authorized agent of Tenderer and Date]

SELF DECLARATION FORMS

FORM SD1

SELF DECLARATION THAT THE PERSON /TENDERER IS NOT DEBARRED IN THE MATTER OF THE PUBLIC PROCUREMENT AND ASSET DISPOSAL ACT 2015.

I, ……., of Post Office Box ……. being a resident of ……. in the Republic of ……. do hereby make a statement as follows: -

1. THAT I am the Company Secretary/ Chief Executive/ Managing Director/ Principal Officer/ Director of

……. *(insert name of the Company)* who is a Bidder in respect of Tender No. …….. for SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT (*insert tender title/description)* for Kenya Airports Authority *(insert name of the Procuring entity)* and duly authorized and competent to make this statement.

2. THAT the afore said Bidder, its Directors and subcontractors have not been debarred from participating in procurement proceeding under Part IV of the Act.

3. THAT what is deponed to here in above is true to the best of my knowledge, information and belief.

…… …… ……

(Title) (Signature) (Date)

Bidder's Official Stamp

FORM SD2

SELF DECLARATION THAT THE PERSON/TENDERER WILL NOT ENGAGE IN ANY CORRUPT OR

FRAUDULENT PRACTICE.

I, ...of P. O. Box.....being a resident of

.....in the Republic of..... do hereby make a statement as follows: -

1. THAT I am the Chief Executive/ Managing Director/ Principal Officer/ Director of…….....

…… *(insert name of the Company)* who is a Bidder in respect of Tender No. …….. for SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT . *(insert tender title/description)* for Kenya Airports Authority *(insert name of the Procuring entity)* and duly authorized and competent to make this statement.

2. THAT the afore said Bidder, its servants and/ or agents/ subcontractors will not engage in any corrupt or fraudulent practice and has not been requested to pay any inducement to any member of the Board, Management, Staff and/or employees and/or agents of ……. *(insert name of the Procuring entity)* which is the procuring entity.

3. THAT the aforesaid Bidder, its servants and/ or agents/ subcontractor shave not offered any inducement to any member of the Board, Management, Staff and/ or employees and/ or agents of

……. (name of the procuring entity).

4. THAT the aforesaid Bidder will not engage/ has not engaged in any corrosive practice with other bidders participating in the subject tender.

5. THAT what is deponed to here in above is true to the best of my knowledge information and belief.

…… …… ……

(Title) (Signature) (Date)

Bidder's Official Stamp

DECLARATION AND COMMITMENT TO THE CODE OF ETHICS

I, ……*(person)*
on behalf of
(Name of the Business/ Company/ Firm) …… declare that I have read and fully understood the contents of the Public Procurement & Asset Disposal Act, 2015, Regulations and the Code of Ethics for persons participating in Public Procurement and Asset Disposal and my responsibilities under the Code.

I do hereby commit to abide by the provisions of the Code of Ethics for persons participating in Public Procurement and Asset Disposal.

Name of Authorized Signatory.....

Sign.....

Position.....
.....

Office address.....Telephone.....
.....

E-mail.....
.....

Name of the Firm/Company.....

Date.....

(Company Seal/ Rubber Stamp where Applicable)

Witness

Name.....

.....

Sign.....
.....

Date.....
.....

SCHEDULE OF RATES AND PRICES

Schedule No. 1. Plant and Mandatory Spare Parts Supplied from Abroad

Item	Description	Code[1]		Qty.		Unit Price[2]		Total Price[2]
							CIP	
				(1)		*(2)*	*(3)*	*(1) x (3)*

		TOTAL (to Schedule No. 5. Grand Summary)						

Country of Origin Declaration Form

Item	Description	Code	Country

Schedule No. 2. Plant and Mandatory Spare Parts Supplied from Within Kenya

Item	Description	Qty.	EXW Unit Price[1]	EXW Total Price[1]
		(1)	*(2)*	*(1) x (2)*
TOTAL (to Schedule No. 5. Grand Summary)				

Name of Tender_____

Signature _____

[1] Specify currency in accordance with ITT 18

Schedule No. 3. Design Services

Item	Description	Qty.	Unit Price[1]		Total Price[1]
			Local Currency Portion	Foreign Currency Portion	
		(1)	*(2)*	*(optional)*	*(1) x (2)*

TOTAL (to Schedule No. 5. Grand Summary)					

Name of Tenderer _____ Signature _____

Schedule No. 4. Installation and Other Services

Item	Description	Qty.	Unit Price[1]		Total Price[1]	
			Foreign Currency Portion	Local Currency Portion	Foreign	Local
		(1)	*(2)*	*(3)*	*(1) x (2)*	*(1) x (3)*
TOTAL (to Schedule No. 5. Grand Summary)						

Name of Tenderer_____ Signature _____

[1] Specify currency in accordance with ITT 18

Schedule No. 5. Grand Summary

Item	Description	Total Price[1]	
		Foreign	Local
	Total Schedule No. 1. Plant, and Mandatory Spare Parts Supplied from Abroad		
	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Within Kenya		
	Total Schedule No. 3. Design Services		
	Total Schedule No. 4. Installation and Other Services		

TOTAL (to Tender Form)	

Name of Tenderer_____ Signature _____

[1]Specify currency in accordance with ITT 18. Create and use as many columns for Foreign Currency requirement as there are foreign currencies

Schedule No. 6. Recommended Spare Parts

Item	**Description**	**Qty.**	**Unit Price**		**Total Price**
			CIF or CIP (foreign parts)	**EXW (local parts)**	
		(1)	*(2)*	*(3)*	*(1) x (2) or (3)*

Name of Tenderer_____ Signature _____

Price Adjustment

Where the Contract Period (excluding the Defects Liability Period) exceeds eighteen (18) months, it is normal procedure that prices payable to the Contractor shall be subject to adjustment during the performance of the Contract to reflect changes occurring in the cost of labor and material components. In such cases the Tendering document shall include in this form a formula of the following general type, pursuant to SCC Sub-Clause11.2.

Where Contracts are of a shorter duration than eighteen (18) months or in cases where there is to be no Price Adjustment, the following provision shall not be included. Instead, it shall be indicated under this form that the prices are to remain firm and fixed for the duration of the Contract.

e with ITT 18. Create and use as many columns for Foreign Currency requirement as there are foreign currencies

Sample Price Adjustment Formula

If in accordance with GCC 11.2, prices shall be adjustable, the following method shall be used to calculate the price adjustment:

Prices payable to the Contractor, in accordance with the Contract, shall be subject to adjustment during performance of the Contract to reflect changes in the cost of labor and material components, in accordance with the following formula:

$$P_1 = P_0 \times (a + b\frac{L_1}{L_0} + c\frac{M_1}{M_0}) - P_0$$

P^1 =Adjustment amount payable to the Contractor

P^0 =Contract price (base price)

a =Percentage of Fixed Element in Contract Price (a=%)

b =Percentage of Labour Component in Contract price (b=%)

c =Percentage of material and equipment component in Contract price (c=%)

L0, L1 =Labour indices applicable to the appropriate industry in the country of origin on the base date and the date

For adjustment, respectively

M0,M1 = material and equipment indices in the country of origin on the base date and the date for adjustment, respectively

N.B. a+b+c= 100%.

Conditions Applicable to Price Adjustment

The Tenderer shall indicate the source of labour, source of exchange rate and materials indices and the base date indices in its Tender.

Item Source of Indices Used Base Date Indices.

The base date shall be the date thirty (30) days prior to the Tender closing date.

The date of adjustment shall be the mid-point of the period of manufacture or installation of component or Plant. The following conditions shall apply:

(a) No price increase will be allowed beyond the original delivery date unless covered by an extension of time awarded by the Procuring Entity under the terms of the Contract. No price increase will be allowed for periods of delay for which the Contractor is responsible. The Procuring Entity will, however, be entitled to any price decrease occurring during such periods of delay.

(b) If the currency in which the Contract price, P0, is expressed is different from the currency of the country of origin of the labour and/or materials indices, a correction factor will be applied to avoid incorrect adjustments of the Contract price. The correction factor shall be: Z0/Z1, where,

Z^0=the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price P^0 on the Base date, and

Z^1=the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price P^0 on the Date of Adjustment.

(c) No price adjustment shall be payable on the portion of the Contract price paid to the Contractor as an advance payment.

TECHNICAL PROPOSAL

- Site Organization
- Method Statement
- Mobilization Schedule
- Construction Schedule
- Plant
- Contractor's Equipment
- Personnel
- Proposed Subcontractors for Major Items of Plant and Installation Services
- Others

SITE ORGANIZATION

METHOD STATEMENT

MOBILIZATION SCHEDULE

CONSTRUCTION SCHEDULE

Contractor's Equipment Form EQU

The Tenderer shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key Contractor's equipment listed in Section III, Evaluation and Qualification Criteria. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Tenderer.

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment o Owned o Rented o Leased o Specially manufactured	

Omit the following information for equipment owned by the

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

Functional Guarantees

The Tenderer shall copy in the left column of the table below, the identification of each functional guarantee required in the Specification and stated by the Procuring Entity in para.1.2 (c) of Section III, Evaluation and Qualification Criteria, and in the right column, provide the corresponding value for each functional guarantee of the proposed plant and equipment.

Required Functional Guarantee	**Value of Functional Guarantee of the Proposed Plant and Equipment**
1.	
2.	
3.	
…	

Personnel

Form PER -1- Proposed Personnel

Tenderers should provide the names of suitably qualified personnel to meet the specified requirements stated in Section III. The data on their experience should be supplied using the Form below for each candidate.

1.	**Title of position***
	Name
2.	**Title of position***
	Name
3.	**Title of position***
	Name
4.	**Title of position***
	Name

*As listed in Section III.

Form PER-2- Resume of Proposed Personnel

Name of Tenderer_____

Position		
Personnel information	**Name**	**Date of birth**
	Professional qualifications	
Present employment	**Name of Procuring Entity**	
	Address of Procuring Entity	
	Telephone	**Contact (manager / personnel officer)**
	Fax	**E-mail**
	Job title	**Years with present Procuring Entity**

Summarize professional experience over the last 20 years, in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company / Project / Position / Relevant technical and management experience

Proposed Subcontractors for Major Items of Plant and Installation Services

A list of major items of Plant and Installation Services is provided below.

The following Subcontractors and/or manufacturers are proposed for carrying out the item of the facilities indicated. Tenderers are free to propose more than one for each item

Major Items of Plant and Installation Services	Proposed Subcontractors/Manufacturers	Nationality

Others - Time Schedule

(to be used by Tenderer when alternative Time for Completion is invited in ITT 13.2)

Tenderers Qualification Without Prequalification

To establish its qualifications to perform the contract in accordance with Section III, Evaluation and Qualification Criteria the Tenderer shall provide the information requested in the corresponding Information Sheets included here under.

All listed documents in the 'documents required' column in the qualification table.

Form ELI 1.1

Tenderer Information Sheet

Date: _

ITT No.:

1. Tenderer's Legal Name
2. In case of JV, legal name of each party:
3. Tenderer's actual or intended Country of Registration:
4. Tenderer's Year of Registration:
5. Tenderer's Legal Address in Country of Registration:
6. Tenderer's Authorized Representative Information Name: Address: Telephone/Fax numbers: Email Address:
7. Attached are copies of original documents of: Articles of Incorporation or Registration of firm named in 1, above, in accordance with ITT 4.1 and ITT 4.4. In case of JV, Form of intent to form JV including a draft agreement, or JV agreement, in accordance with ITT 4.1 and ITT 11.2. In case of state-owned enterprise or institution from Kenya, documents establishing legal and financial autonomy and compliance with the principles of commercial law, and is not under the supervision of the Procuring Entity in accordance with ITT 4.6.

Please note that a written authorization needs to be attached to this sheet as

Form ELI 1.2

Party to JV Information Sheet

Date: ___

ITT No.: _____

1. Tenderer's Legal Name:
2. JV's Party legal name:
3. JV's Party Country of Registration:
4. JV's Party Year of Registration:
5. JV's Party Legal Address in Country of Registration:
6. JV's Party Authorized Representative Information Name: Address: Telephone/Fax numbers: Email Address:
7. Attached are copies of original documents of: Articles of Incorporation or Registration of firm named in 1, above, in accordance with ITT 4.1 and ITT 4.4. In case of state-owned enterprise or institution from Kenya, documents establishing legal and financial autonomy and compliance with the principles of commercial law and is not under the supervision of the Procuring Entity, in accordance with ITT 4.6.

Form CON – 2

Historical Contract Non-Performance

Tenderer's Legal Name: _____

Date: _

JV Member Legal Name: _____

ITT No.: _____

Non-Performed Contracts in accordance with Section III, Evaluation and Qualification Criteria			
☐ Contract non-performance did not occur since 1st January *[insert year]* specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.1. ☐ Contract(s) not performed since 1st January *[insert year]* specified in Section III, Evaluation and Qualification Criteria, requirement 2.1			
Year	**Non-performed portion of contract**	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and Kenya Shilling equivalent)**
[insert year]	*[insert amount and percentage]*	Contract Identification: *[indicate complete contract name/ number, and any other identification]* Name of Procuring Entity: *[insert full name]* Address of Procuring Entity: *[insert City/ street/ building/ floor number/ room number/ country]* Reason(s) for non-performance: *[indicate main reason(s)]*	*[insert amount]*
Pending Litigation, in accordance with Section III, Evaluation and Qualification Criteria			
☐ No pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3. ☐ Pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3 as indicated below.			

Year of Dispute	**Amount in Dispute (currency)**	**Contract Identification**	**Total Contract Amount (currency), Kenya Shilling Equivalent (exchange rate)**
		Contract Identification: _____ Name of Procuring Entity: _____ Address of Procuring Entity: _____ Matter in dispute: _____ Party who initiated the dispute: ____ Status of dispute: _____	

Year of Dispute	Amount in Dispute (currency)	Contract Identification	Total Contract Amount (currency), Kenya Shilling Equivalent (exchange rate)
		Contract Identification: Name of Procuring Entity: Address of Procuring Entity: Matter in dispute: Party who initiated the dispute: Status of dispute:	

Litigation History in accordance with Section III, Evaluation and Qualification Criteria

☐ No Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4.

☐ Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4 as indicated below.

[insert year]	*[insert percentage]*	Contract Identification: [indicate complete contract name, number, and any other identification] Name of Procuring Entity: *[insert full name]* Address of Procuring Entity: *[insert City/ street/building/floor number/room number/country]* Matter in dispute: *[indicate main issues in dispute]* Party who initiated the dispute: *[indicate "Procuring Entity" or "Contractor"]* Reason(s) for Litigation and award decision *[indicate main reason(s)]*	*[insert amount]*

Form CCC

Current Contract Commitments / Works in Progress

Tenderers and each member to a JV should provide information on their current commitments on all contracts that have been awarded, or for which a Form of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Name of Contract	**Procuring Entity, Contact Address/Tel**	**Value of Outstanding Work (current Kenya Shilling equivalent)**	**Estimated Completion Date**	**Average Monthly Invoicing Over Last Six Months (Kenya Shilling /month)**
1.				
2.				
3.				
4.				
5.				
etc.				

Form FIN – 3.1

Financial Situation

Historical Financial Performance

Tenderer's Legal Name: _____ Date: _____

JV Member Legal Name: _____ ITT No.: _____

To be completed by the Tenderer and, if JV, by each member

Financial information in KShilling equivalent	**Historic information for previous _____ (__) years** **(Kenya Shilling Equivalent in 000s)**						
	Year 1	**Year 2**	**Year 3**	**Year …**	**Year n**	**Avg.**	**Avg. Ratio**
Information from Balance Sheet							
Total Assets (TA)							
Total Liabilities (TL)							
Net Worth (NW)							
Current Assets (CA)							
Current Liabilities (CL)							
Information from Income Statement							
Total Revenue (TR)							
Profits Before Taxes (PBT)							

Attached are copies of financial statements (balance sheets, including all related notes, and income statements) for the years required above complying with the following conditions:

a) Must reflect the financial situation of the Tenderer or member to a JV, and not sister or parent companies.

b) Historic financial statements must be audited by a certified accountant.

c) Historic financial statements must be complete, including all notes to the financial statements.

d) Historic financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

Form FIN - 3.2

Average Annual Turnover

Tenderer's Legal Name:_____ Date: _____

JV Member Legal Name:_____ ITT No.: _____

Annual Turnover Data		
Year	**Amount And Currency**	**Kenya Shilling Equivalent**
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
*Average Annual Turnover	_____	_____

*Average annual turnover calculated as total certified payments received for work in progress or completed, divided by the number of years specified in Section III, Evaluation Criteria, Sub-Factor 2.3.2.

Form FIN3.3

Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total cash flow demands of the subject contractor contracts as indicated in Section III, Evaluation and Qualification Criteria.

Source of Financing	**Amount (Kenya Shilling Equivalent)**
1.	
2.	
3.	
4.	

Form EXP 4.1

General Experience

Tenderer's Legal Name: _____

JV Member Legal Name: _____

ITT No.: _____

Date: _

Starting Month / Year	**Ending Month / Year**	**Years***	**Contract Identification**	**Role of Tenderer**
_____	_____		Contract name: Brief Description of the Works performed by the Tenderer: Name of Procuring Entity: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Tenderer: Name of Procuring Entity: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Tenderer: Name of Procuring Entity: Address:	_____

Starting Month / Year	Ending Month / Year	Years*	Contract Identification	Role of Tenderer
_____	_____		Contract name: Brief Description of the Works performed by the Tenderer: Name of Procuring Entity: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Tenderer: Name of Procuring Entity: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Tenderer: Name of Procuring Entity: Address:	_____

Form EXP –4.2(a)

Specific Experience

Tenderer's Legal Name: _____

JV Member Legal Name: _____

Similar Contract No. __ [insert specific number] of [total number of contracts] required	**Information**
Description of the similarity in accordance with Sub-Factor 4.2a) of Section III:	
Amount	_____
Physical size	_____
Complexity	_____
Methods/Technology	_____
Physical Production Rate	_____

Form EXP –4.2(b)

Specific Experience in Key Activities

Tenderer's Legal Name: _____ Date: _____

JV Member Legal Name: _____ ITT No.: _____

Subcontractor's Legal Name: _____

	Information		
Contract Identification	_____		
Award date Completion date	_____ _____		
Role in Contract	• Contractor	• Management Contractor	•Subcontractor
Total contract amount	_____		KES_____
If member in a JV or subcontractor, specify participation of total contract amount	_____%	_____	KES_____
Procuring Entity's Name:	_____		
Address: Telephone/fax number: E-mail:	_____ _____ _____ _____		

FORM OF TENDER SECURITY-[Option 1–Demand Bank Guarantee]

Beneficiary: _____

Request for Tenders No: _____

Date: _____

TENDER GUARANTEE No.: _____

Guarantor: _____

1. We have been informed that _____ (here inafter called "the Applicant") has submitted or will submit to the Beneficiary its Tender (here inafter called" the Tender") for the execution of _____ under Request for Tenders No. _____

("the ITT").

2. Furthermore, we understand that, according to the Beneficiary's conditions, Tenders must be supported by a Tender guarantee.

3. At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____(__) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

(a) has withdrawn its Tender during the period of Tender validity set forth in the Applicant's Letter of Tender ("the Tender Validity Period"), or any extension thereto provided by the Applicant; or

b) having been notified of the acceptance of its Tender by the Beneficiary during the Tender Validity Period or any extension there-to provided by the Applicant, (i) has failed to execute the contract agreement, or (ii) has failed to furnish the Performance.

4. This guarantee will expire: (a) if the Applicant is the successful Tenderer, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security and, or (b) if the Applicant is not the successful Tenderer, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Tendering process; or (ii) thirty days after the end of the Tender Validity Period.

5. Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

[signature(s)]

Note: All italicized text is for use in preparing this form and shall be deleted from the final product.

FORMAT OF TENDER SECURITY [Option 2–Insurance Guarantee]

TENDER GUARANTEE No.: __

1. Whereas …… [*Name of the tenderer]* (hereinafter called "the tenderer") has submitted its tender dated …… [*Date of submission of tender]* for the …… *[Name and/or description of the tender]* (hereinafter called "the Tender") for the execution of_____under Request for Tenders No._____ _____("the ITT").

2. KNOW ALL PEOPLE by these presents that WE …… of …… [**Name of Insurance Company**] having our registered office at …… (hereinafter called "the Guarantor"), are bound unto …… [*Name of Procuring Entity*] (hereinafter called "the Procuring Entity") in the sum of …… (Currency and guarantee amount) for which payment well and truly to be made to the said Procuring Entity, the Guarantor binds itself, its successors and assigns, jointly and severally, firmly by these presents.

Sealed with the Common Seal of the said Guarantor this ___day of _____ 20 __.

3. NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Applicant:

a) has withdrawn its Tender during the period of Tender validity set forth in the Principal's Letter of Tender ("the Tender Validity Period"), or any extension thereto provided by the Principal; or

b) having been notified of the acceptance of its Tender by the Procuring Entity during the Tender Validity Period or any extension thereto provided by the Principal; (i) failed to execute the Contract agreement; or (ii) has failed to furnish the Performance Security, in accordance with the Instructions to tenderers ("ITT") of the Procuring Entity's Tendering document.

then the guarantee undertakes to immediately pay to the Procuring Entity up to the above amount upon receipt of the Procuring Entity's first written demand, without the Procuring Entity having to substantiate its demand, provided that in its demand the Procuring Entity shall state that the demand arises from the occurrence of any of the above events, specifying which event(s) has occurred.

4. This guarantee will expire: (a) if the Applicant is the successful Tenderer, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security and, or (b) if the Applicant is not the successful Tenderer, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Tendering process; or (ii)twenty-eight days after the end of the Tender Validity Period.

5. Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

_____ _____

[Date] *[Signature of the Guarantor]*

_____ _____

[Witness] *[Seal]*

Note: All italicized text is for use in preparing this form and shall be deleted from the final product.

TENDER-SECURING DECLARATION FORM {r 46 and 155(2)}

[The Bidder shall complete this Form in accordance with the instructions indicated] Date:_____*[insert date (as day, month and year) of Tender Submission]* Tender No.:_____*[insert number of tendering process]*

To:____*[insert complete name of Purchaser]*

I/We, the under signed, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Tender-Securing Declaration.

2. I/We accept that I/ we will automatically be suspended from being eligible for tendering in any contract with the Purchaser for the period of time of [insert number of months or years] starting on [insert date], if we are in breach of our obligation (s) under the bid conditions, because we–(a) have withdrawn our tender during the period of tender validity specified by us in the Tendering Data Sheet; or (b) having been notified of the acceptance of our Bid by the Purchaser during the period of bid validity, (i) fail or refuse to execute the Contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the instructions to tenders.

3. I/ We understand that this Tender Securing Declaration shall expire if we are not the successful Tenderer (s), upon the earlier of:

a) Our receipt of a copy of your notification of the name of the successful Tenderer; or

b) Thirty days after the expiration of our Tender.

4. I/ We understand that if I am/ we are/ in a Joint Venture, the Tender Securing Declaration must be in the name of the Joint Venture that submits the bid, and the Joint Venture has not been legally constituted at the time of bidding, the Tender Securing Declaration shall be in the names of all future partners as named in the letter of intent.

Signed:

.....

.....

Capacity/title (director or partner or sole proprietor, etc.)

..... Name:

.....

.....

Duly authorized to sign the bid for and on behalf of: .....*[insert complete name of Tenderer]*

Dated on.....day of.....*[Insert date of*

signing]

Seal or stamp

MANUFACTURER'S AUTHORIZATION FORM

Date:

ITT No.:

To:

WHEREAS

We, who are official manufacturers of, having factories at
, do hereby authorize to submit a Tender the purpose of which is to provide the following goods, manufactured by us, and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with Clause 27 of the General Conditions, with respect to the goods offered by the above firm.

Signed:

Name:

Title:

Duly authorized to sign this Authorization on behalf of:

Dated on day of,

SCOPE OF SUPPLY OF PLANT AND INSTALLATION SERVICES BY THE CONTRACTOR

Specification

ATTACHED SECTION II OF THE BIDDING DOCUMENTS

FORMS AND PROCEDURES

Form of Completion Certificate

Date:

ITT No:

To:

Dear Ladies and/or Gentlemen,

Pursuant to GCC Clause 24 (Completion of the Facilities) of the General Conditions of the Contract entered into between yourselves and the Procuring Entity dated, relating to the, we hereby notify you that the following part (s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Procuring Entity hereby takes over the said part (s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below.

1. Description of the Facilities or part there of:

2. Date of Completion:

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This Form does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

Title (Project Manager)

FORM OF OPERATIONAL ACCEPTANCE CERTIFICATE

Date:

ITT No:

To:

Dear Ladies and/or Gentlemen,

Pursuant to GCC Sub-Clause 25.3 (Operational Acceptance) of the General Conditions of the Contract entered into between yourselves and the Procuring Entity dated, relating to the, we hereby notify you that the Functional Guarantees of the following part (s) of the Facilities were satisfactorily attained on the date specified below.

1. Description of the Facilities or part there of:

2. Date of Operational Acceptance:

This Form does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

Title (Project Manager)

CHANGE ORDER PROCEDURE AND FORMS

Date: ..... ITT No:

.....
...

CONTENTS

Change Order Procedure

1. **General**

This section provides samples of procedures and forms for implementing changes in the Facilities during the performance of the Contract in accordance with GCC Clause 39 (Change in the Facilities) of the General Conditions.

2. Change Order Log

The Contractor shall keep an up-to-date Change Order Log to show the current status of Requests for Change and Changes authorized or pending, as Annex 8. Entries of the Changes in the Change Order Log shall be made to ensure that the log is up-to-date. The Contractor shall attach a copy of the current Change Order Log in the monthly progress report to be submitted to the Procuring Entity.

3. References for Changes

1) Request for Change as referred to in GCC Clause 39 shall be serially numbered CR-X-nnn.

2) Estimate for Change Proposal as referred to in GCC Clause 39 shall be serially numbered CN-X-nnn.

3) Acceptance of Estimate as referred to in GCC Clause 39 shall be serially numbered CA-X-nnn.

4) Change Proposal as referred to in GCC Clause 39 shall be serially numbered CP-X-nnn.

5) Change Order as referred to in GCC Clause 39 shall be serially numbered CO-X-nnn.

Note:

a) Requests for Change issued from the Procuring Entity's Home Office and the Site representatives of the Procuring Entity shall have the following respective references:

Home Office CR-H-nnn Site CR-S-nnn

b) The above number “nnn” is the same for Request for Change, Estimate for Change Proposal, Acceptance of Estimate, Change Proposal and Change Order.

ANNEX 1. REQUEST FOR CHANGE PROPOSAL

(Procuring Entity's Form head)

To:____Date:_____ Attention:_____

_____ Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

With reference to the captioned Contract, you are requested to prepare and submit a Change Proposal for the Change noted below in accordance with the following instructions within____days of the date of this Form_____.

1. Title of Change: _____
2. Change Request No._____
3. Originator of Change:
4. Procuring Entity: _____
5. Contractor (by Application for Change Proposal No.__:
6. Brief Description of Change: _____
7. Facilities and/or Item No. of equipment related to the requested Change:
8. Reference drawings and/ or technical documents for the

request of Change: Drawing No./ Document No. Description

9. Detailed conditions or special requirements on the requested Change: _____
10. General Terms and Conditions:

a) Please submit your estimate to us showing what effect the requested Change will have on the Contract Price.

b) Your estimate shall include your claim for the additional time, if any, for completion of the requested Change.

c) If you have any opinion negative to the adoption of the requested Change in connection with the conformability to the other provisions of the Contractor the safety of the Plant or Facilities, please inform us of your opinion in your proposal of revised provisions.

d) Any increase or decrease in the work of the Contractor relating to the services of its personnel shall be calculated.

e) You shall not proceed with the execution of the work for the requested Change until we have accepted and confirmed the amount and nature in writing.

(Procuring Entity's Name)

.....

(Signature).....

.....

(Name of signatory)
.....

(Title of signatory)
.....

ANNEX 2. ESTIMATE FOR CHANGE PROPOSAL

(Contractor's Form head)

To:____

Date:_____

Attention:_____

Contract Name: _____ Contract Number: _____

Dear Ladies and/or Gentlemen:
With reference to your Request for Change Proposal, we are pleased to notify you of the approximate cost of preparing the below-referenced Change Proposal in accordance with GCC Sub-Clause 39.2.1 of the General Conditions. We acknowledge that your agreement to the cost of preparing the Change Proposal, in accordance with GCC Sub-Clause 39.2.2, is required before estimating the cost for change work.

1. Title of Change: _____
2. Change Request No./Rev.: _____
3. Brief Description of Change: _____
4. Scheduled Impact of Change: _____
5. Cost for Preparation of Change Proposal:_____[9]

a) Engineering (Amount)

i) Engineer__hrsx_____rate/hr=

ii) Draftsperson_____hrsx_____rate/hr= Sub-total_____hrs

iii) Total Engineering Cost_____

b) Other Cost

Total Cost (a) + (b)

*(Contractor's Name)*_____

*(Signature)*_____

*(Name of signatory)*_____

*(Title of signatory)*_____

.

[9]*Costs shall be in the currencies of the Contract.*

ANNEX 3. ACCEPTANCE OF ESTIMATE

(Procuring Entity's Form head)

To:____Date:_____ Attention:_____

_____ Contract Name: _____

_____ Contract Number: _____

_____ Dear Ladies and/or Gentlemen:

We hereby accept your Estimate for Change Proposal and agree that you should proceed with the preparation of the Change Proposal.

1. Title of Change: _____
2. Change Request No./ Rev.: _____
3. Estimate for Change Proposal No./ Rev.: _____
4. Acceptance of Estimate No./ Rev.: _____
5. Brief Description of Change: _____
6. Other Terms and Conditions: In the event that we decide not to order the Change accepted, you shall be entitled to compensation for the cost of preparation of Change Proposal described in your Estimate for Change Proposal mentioned in para. 3 above in accordance with GCC Clause 39 of the General Conditions.

*(Procuring Entity's Name)*_____

*(Signature)*_____

*(Name and Title of signatory)*_____

ANNEX 4. CHANGE PROPOSAL

(Contractor's Form head)

To:____Date:_____ Attention:_____

_____ Contract Name: _____

_____ Contract Number: _____

_____ Dear Ladies and/or Gentlemen:

In response to your Request for Change Proposal No._____, we hereby submit our proposal as follows:

1. Title of Change: _____

2. Change Proposal No./Rev.: _____

3. Originator of Change:

Procuring Entity: _____

Contractor: _____

4. Brief Description of Change: _____

5. Reasons for Change: _____

6. Facilities and/or Item No. of Equipment related to the requested Change: _____

7. Reference drawings and/ or technical documents for the requested Change: Drawing/ Document No. Description

8. Estimate of increase/ decrease to the Contract Price resulting from Change Proposal: (Amount)

a) Direct material

b) Major construction equipment

c) Direct field labor (Total hrs)

d) Subcontracts

e) Indirect material and labor

f) Site supervision

g) Head office technical staff salaries

Process engineer_____hrs @

_____rate/hr Project engineer_____hrs @

_____rate/hr Equipment engineer_____hrs @_____

_____rate/hr Procurement_____hrs@_____

_____rate/hr Drafts person_____hrs@_____

_____rate/hr Total_____

_____hrs

h) Extraordinary costs (computer, travel, etc.)

i) Fee for general administration,_____% of Items

j) Taxes and customs duties

Total lump sum cost of Change Proposal

(Sum of items (a) to (j))

Cost to prepare Estimate for Change Proposal

(Amount payable if Change is not accepted)

9. Additional time for Completion required due to Change Proposal

10. Effect on the Functional Guarantees

11. Effect on the other terms and conditions of the Contract

12. Validity of this Proposal: within [Number] days after receipt of this Proposal by the Procuring Entity

13. Other terms and conditions of this Change Proposal:

a) You are requested to notify us of your acceptance, comments or rejection of this detailed Change Proposal within_____days from your receipt of this Proposal.

b) The amount of any increase and/or decrease shall be taken into account in the adjustment of the Contract Price.

c) Contractor's cost for preparation of this Change Proposal:[2]

(Contractor's Name)

_____

_____

(Signature)

_____

(Name of signatory)

_____

(Title of signatory)

_____

[2] *Specify where necessary*

ANNEX 5. CHANGE ORDER

(Procuring Entity's Form head)

To:

Date: Attention:_____

Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

We approve the Change Order for the work specified in the Change Proposal (No.__), and agree to adjust the Contract Price, Time for Completion and/or other conditions of the Contract in accordance with GCC Clause 39 of the General Conditions.

1. Title of Change:

_____

2. Change Request No./Rev.:

_____

3. Change Order No./ Rev.:

_____

4. Originator of Change:_____ Procuring Entity:

_____

Contractor:

_____

5. Authorized Price:_____

Ref. No.:_____ Date:

_____

Foreign currency portion_____ plus Local currency portion

_____

6. Adjustment of Time for Completion

None Increase__ Days Decrease_____ days

7. Other effects, if any

Authorized by:_____ Date:

_____

(Procuring Entity)

Accepted by:_____ Date:

_____

(Contractor)

ANNEX 6. PENDING AGREEMENT CHANGE ORDER

(Procuring Entity's Form head)

To:____Date:_____ Attention:_____

_____ Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

We instruct you to carry out the work in the Change Order detailed below in accordance with GCC Clause 39 of the General Conditions.

1. Title of Change: _____

2. Procuring Entity's Request for Change Proposal No./Rev.:_____dated: _____

3. Contractor's Change Proposal No./Rev.:_____dated: _____

4. Brief Description of Change: _____

5. Facilities and/or Item No. of equipment related to the requested Change: _____

6. Reference Drawings and/or technical documents for the

requested Change: Drawing/Document No. Description

7. Adjustment of Time for Completion:

8. Other change in the Contract terms:

9. Other terms and conditions:

*(Procuring Entity's Name)*_____

_____ *(Signature))*_____

(Name of signatory))

_____*(Title of signatory))*_____

ANNEX 7. APPLICATION FOR CHANGE PROPOSAL

(Contractor's Form head)

To:____Date:_____ Attention:_____

_____ Contract Name: _____

_____ Contract Number: _____

_____

Dear Ladies and/or Gentlemen:

We hereby propose that the below-mentioned work be treated as a Change in the Facilities.

1. Title of Change:

_____

2. Application for Change Proposal No./Rev.:_____dated:

_____

3. Brief Description of Change: _____

4. Reasons for Change:

5. Order of Magnitude Estimation (in the currencies of the Contract):

6. Scheduled Impact of Change:

7. Effect on Functional Guarantees, if any:

8. Appendix:

(Contractor's Name)

_____

(Signature)

_____

(Name of signatory)

_____

(Title of signatory)

_____

DRAWINGS

ATTACHED

SUPPLEMENTARY INFORMATION

PART 3 – CONDITIONS OF CONTRACT

AND CONTRACT FORMS

GENERAL CONDITIONS OF CONTRACT

A. Contract and Interpretation

1. Definitions

1.1 The following words and expressions shall have the meanings here by assigned to them:

"Contract" means the Contract Agreement entered into between the Procuring Entity and the Contractor, together with the Contract Documents referred to there in; they shall constitute the Contract, and the term "the Contract" shall in all such documents be construed accordingly.

"Contract Documents" means the documents listed in Article 1.1 (Contract Documents) of the Contract Agreement (including any amendments thereto).

"GCC" means the General Conditions of Contract hereof. "SCC" means the Special Conditions of Contract.

"day" means calendar day. "year" means 365 days. "month" means calendar month.

"Party" means the Procuring Entity or the Contractor, as the context requires, and "Parties" means both of them.

"Procuring Entity" means the public entity named as such in the SCC and includes the legal successors or permitted assigns of the Procuring Entity.

"Project Manager" means the person appointed by the Procuring Entity in the manner provided in GCC Sub- Clause 17.1 (Project Manager) hereof and named as such in the SCC to perform the duties delegated by the Procuring Entity.

"Contractor" means the person(s) whose Tender to perform the Contract has been accepted by the Procuring Entity and is named as Contractor in the Contract Agreement, and includes the legal successors or permitted assigns of the Contractor.

"Contractor's Representative" means any person nominated by the Contractor and approved by the Procuring Entity in the manner provided in GCC Sub-Clause 17.2 (Contractor's Representative and Construction Manager) here of to perform the duties delegated by the Contractor.

"Construction Manager" means the person appointed by the Contractor's Representative in the manner provided in GCC Sub-Clause 17.2.4.

"Subcontractor," including manufacturers, means any person to whom execution of any part of the Facilities, including preparation of any design or supply of any Plant, is sub-contracted directly or indirectly by the Contractor, and includes its legal successors or permitted assigns.

"Dispute Board" (DB) means the person or persons named as such in the SCC appointed by agreement between the Procuring Entity and the Contractor to make a decision with respect to any dispute or difference between the Procuring Entity and the Contractor referred to him or her by the Parties pursuant to GCC Sub-Clause 46.1 (Dispute Board) hereof.

"Contract Price" means the sum specified in Article 2.1 (Contract Price) of the Contract Agreement, subject to such additions and adjustments there to or deductions there from, as may be made pursuant to the Contract.

"Facilities" means the Plant to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract.

“Plant” means permanent plant, equipment, machinery, apparatus, materials, articles and things of all kinds to be provided and incorporated in the Facilities by the Contractor under the Contract (including the spare parts to be supplied by the Contractor under GCC Sub-Clause7.3 here of), but does not include Contractor's Equipment.

“Installation Services” means all those services ancillary to the supply of the Plant for the Facilities, to be provided by the Contractor under the Contract, such as transportation and provision of marine or other similar insurance, inspection, expediting, site preparation works (including the provision and use of Contractor's Equipment and the supply of all construction materials required), installation, testing, pre-commissioning, commissioning, operations, maintenance, the provision of operations and maintenance manuals, training, etc…as the case may require.

“Contractor's Equipment” means all facilities, equipment, machinery, tools, apparatus, appliances or things of every kind required in or for installation, completion and maintenance of Facilities that are to be provided by the Contractor, but does not include Plant, or other things intended to form or forming part of the Facilities.

“Country of Origin” means the countries and territories eligible as elaborated in the SCC.

“Site” means the land and other places upon which the Facilities are to be installed, and such other land or places as may be specified in the Contract as forming part of the Site.

“Effective Date” means the date of fulfillment of all conditions stated in Article 3 (Effective Date) of the Contract Agreement, from which the Time for Completion shall be counted.

“Time for Completion” means the time within which Completion of the Facilities as a whole (or of a part of the Facilities where a separate Time for Completion of such part has been prescribed) is to be attained, as referred to in GCC Clause8 and in accordance with the relevant provisions of the Contract.

“Completion” means that the Facilities (or a specific part thereof where specific parts are specified in the Contract) have been completed operationally and structurally and put in a tight and clean condition, that all work in respect of Pre-commissioning of the Facilities or such specific part thereof has been completed, and that the Facilities or specific part thereof are ready for Commissioning as provided in GCC Clause 24 (Completion) hereof.

“Pre-commissioning” means the testing, checking and other requirements specified in the Procuring Entity's Requirements that are to be carried out by the Contractor in preparation for Commissioning as provided in GCC Clause24 (Completion) hereof.

“Commissioning” means operation of the Facilities or any part thereof by the Contractor following Completion, which operation is to be carried out by the Contractor as provided in GCC Sub-Clause 25.1 (Commissioning) hereof, for the purpose of carrying out Guarantee Test(s).

“Guarantee Test(s)” means the test(s) specified in the Procuring Entity's Requirements to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, in accordance with the provisions of GCC Sub-Clause25.2 (Guarantee Test) hereof.

“Operational Acceptance” means the acceptance by the Procuring Entity of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts), which certifies the Contractor's fulfilment of the Contract in respect of Functional Guarantees of the Facilities (or the relevant part thereof) in accordance with the provisions of GCC Clause 28 (Functional Guarantees) hereof and shall include deemed acceptance in accordance with GCC Clause 25 (Commissioning and Operational

Acceptance) hereof.

"Defect Liability Period" means the period of validity of the warranties given by the Contractor commencing at Completion of the Facilities or a part thereof, during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof) as provided in GCC Clause 27(Defect Liability) hereof.

"Notice of Dissatisfaction" means the notice given by either Party to the other under Sub-Clause 46.4 indicating its dissatisfaction and intention to commence arbitration.

2. Contract Documents

2.1 Subject to Article 1.2 (Order of Precedence) of the Contract Agreement, all documents forming part of the Contract (and all parts thereof) are intended to be correlative, complementary and mutually explanatory. The Contract shall be read as a whole.

3. Interpretation

3.1 In the Contract, except where the context requires otherwise:

a) Words indicating one gender include all genders;

b) words indicating the singular also include the plural and words indicating the plural also include the singular;

c) provisions including the word "agree," "agreed," or "agreement" require the agreement to be recorded in writing;

d) the word "tender" is synonymous with "Tender," "tenderer," with "Tenderer," and "tender documents" with "Tendering Document," and

e) "written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

The marginal words and other headings shall not be taken in to consideration in the interpretation of these Conditions.

3.2 Incoterms

Unless inconsistent with any provision of the Contract, the meaning of any trade term and the rights and obligations of Parties thereunder shall be as prescribed by Incoterms.

Incoterms means international rules for interpreting trade terms published by the International Chamber of Commerce (latest edition), 38 C ours Albert 1er, 75008 Paris, France.

3.3 Entire Agreement

3.3.1 Subject to GCC Sub-Clause 16.4 hereof, the Contract constitutes the entire agreement between the Procuring Entity and Contractor with respect to the subject matter of Contract and supersedes all communications, negotiations and agreements (whether written or oral) of Parties with respect there to made prior to the date of Contract.

3.4 Amendment

No amendment or other variation of the Contract shall be effective unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each Party hereto.

3.5 Independent Contractor

The Contractor shall be an independent contract or performing the Contract. The Contract does not create any agency, partnership, joint venture or other joint relationship between the Parties hereto. Subject to the provisions of the Contract, the Contractor shall be solely responsible for the manner in which the Contract is performed. All employees, representatives or Subcontractors engaged by the Contractor in connection with the performance of the Contract shall be under the complete control of the Contractor and shall not be deemed to be employees of the Procuring Entity, and nothing contained in the Contractor in any subcontract awarded by the Contractor shall be construed to create any contractual relationship between any such employees, representatives or Subcontractors and the Procuring Entity.

3.6 Non-Waiver

3.6.1 Subject to GCC Sub-Clause 3.6.2 below, no relaxation, forbearance, delay or indulgence by either Party in enforcing any of the terms and conditions of the Contract or the granting of time by either Party to the other shall prejudice, affect or restrict the rights of that Party under the Contract, nor shall any waiver by either Party of any breach of Contract operate as waiver of any subsequent or continuing breach of Contract.

3.6.2 Any waiver of a Party's rights, powers or remedies under the Contract must be in writing, must be dated and signed by an authorized representative of the Party granting such waiver, and must specify the right and the extent to which it is being waived.

3.7 Severability

If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, in validity or unenforced ability shall not affect the validity or enforce ability of any other provisions and conditions of the Contract.

3.8 Country of Origin

“Origin” means the place where the plant and component parts thereof are mined, grown, produced or manufactured, and from which the services are provided. Plant components are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that is substantially in its basic characteristics or in purpose or utility from its components.

4. Communications

4

4.3 Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices, requests and discharges, these communications shall be:

a In writing and delivered against receipt; and

b delivered, sent or transmitted to the address for the recipient's communications as stated in the Contract Agreement.

When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Project Manager, a copy shall be sent to the Project Manager or the other Party, as the case may be.

5. Law and Language

5

5.3 The Contract shall be governed by in accordance with laws of Kenya

5.4 The ruling language of the Contract shall be English Language.

5.5 The language for communications shall be the English language.

6. Fraud and Corruption

6.1 The Procuring Entity requires compliance with the provisions of the Public Procurement and Asset Disposal Act, 2015, Section 62 as set forth in Section ……" Declaration not to engage in corruption". The tender submitted by a person shall include a declaration that the person shall not engage in any corrupt or fraudulent practice and a declaration that the person or his or her sub-contractors are not debarred from participating in public procurement proceedings.

6.2 Tenderers shall permit and shall cause their agents (where declared or not), subcontractors, sub-consultants, service providers, suppliers, and their personnel, to permit the PPRA to inspect all accounts, records and other documents relating to any initial selection process, prequalification process, tender submission, proposal submission, and contract performance (in the case of award), and to have them audited by auditors appointed by the PPRA.

B. Subject Matter of Contract

7. Scope of Facilities

7

7.1 Unless otherwise expressly limited in the Procuring Entity's Requirements, the Contractor's obligations cover the provision of all Plant and the performance of all Installation Services required for the design, and the manufacture (including procurement, quality assurance, construction, installation, associated civil works, Pre- commissioning and delivery) of the Plant, and the installation, completion and commissioning of the Facilities in accordance with the plans, procedures, specifications, drawings, codes and any other documents as specified in the Section, Procuring Entity's Requirements. Such specifications include, but are not limited to, the provision of supervision and engineering services; the supply of labor, materials, equipment, spare parts (as specified in GCC Sub-Clause 7.3 below) and accessories; Contractor's Equipment; construction utilities and supplies; temporary materials, structures and facilities; transportation (including, without limitation, unloading and hauling to, from and at the Site); and storage, except for those supplies, works and services that will be provided or performed by the Procuring Entity, asset for thin the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity.

7.2 The Contractor shall, unless specifically excluded in the Contract, perform all such work and/or supply all such items and materials not specifically mentioned in the Contract but that can be reasonably inferred from the Contract as being required for attaining Completion of the Facilities as if such work and/or items and materials were expressly mentioned in the Contract.

7.3 In addition to the supply of Mandatory Spare Parts included in the Contract, the Contractor agrees to supply spare parts required for the operation and maintenance of the Facilities for the period specified in the SCC and the provisions, if any, specified in the SCC. However, the identity, specifications and quantities of such spare parts and the terms and conditions relating to the supply there of are to be agreed between the Procuring Entity and the Contractor, and the price of such spare parts shall be that given in Price Schedule No.6, which shall be added to the Contract Price. The price of such spare parts shall include the purchase price there for and other costs and expenses (including the Contractor's fees) relating to the supply of spare parts.

8. Time for Commencement and Completion

8

8.1 The Contractor shall commence work on the Facilities within the period specified in the SCC and without prejudice to GCC Sub-Clause 26.2 hereof, the Contractor shall thereafter proceed with the Facilities in accordance with the time schedule specified in the Appendix to the Contract Agreement titled Time Schedule.

8.2 The Contractor shall attain Completion of the Facilities or of a part where a separate time for Completion of such part is specified in the Contract, within the time stated in the SCC or within such extended time to which the Contractor shall be entitled under GCC Clause 40 hereof.

9. Contractor's Responsibilities

6

7

8

9

9.1 The Contractor shall design, manufacture including associated purchases and/or subcontracting, install and complete the Facilities in accordance with the Contract. When completed, the Facilities should be fit for the purposes for which they are intended as defined in the Contract.

9.2 The Contractor confirms that it has entered in to this Contract on the basis of a proper examination of the data relating to the Facilities including any data as to boring tests provided by the Procuring Entity, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site if access there to was available and of other data readily available to it relating to the Facilities as of the date twenty-eight (28) days prior to Tender submission. The Contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities.

9.3 The Contractor shall acquire and pay for all permits, approvals and /or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals and/or licenses that are not the responsibility of the Procuring Entity under GCC Sub- Clause10.3 hereof and that are necessary for the performance of the Contract.

9.4 The Contractor shall comply with all laws in force in the country where the Facilities are to be implemented. The laws will include all local, state, national or other laws that affect the performance of the Contract and bind upon the Contractor. The Contractor shall indemnify and hold harmless the Procuring Entity from and against any and all liabilities, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such laws by the Contractor or its personnel, including the Subcontractors and their personnel, but without prejudice to GCC Sub-Clause 10.1 hereof.

9.5 Any Plant and Installation Services that will be incorporated in or be required for the Facilities and

other supplies shall have their origin as specified under GCC Clause 1 (Country of Origin). Any subcontractors retained by the Contractor shall be from a country as specified in GCC Clause1 Country of Origin).

9.6 If the Contractor is a joint venture, or association (JV) of two or more persons, all such persons shall be jointly and severally bound to the Procuring Entity for the fulfilment of the provisions of the Contract, and shall designate one of such persons to act as a leader with authority to bind the JV. The composition or the constitution of the JV shall not be altered without the prior consent of the Procuring Entity.

9.7 Pursuant to paragraph 2.2 e. of Appendix B to the General Conditions the Contractor shall permit and shall cause its subcontractors and sub-consultants to permit, PPRA and/or persons appointed by PPRA to inspect the Site and/or the accounts and records relating to the procurement process, selection and/or contract execution, and to have such accounts and records audited by auditors appointed by PPRA. The Contractor's and its Subcontractors' and sub-consultants' attention is drawn to Sub-Clause 6.1 which provides, interalia, that acts intended to materially impede the exercise of the PPRA's inspection and audit rights constitute a prohibited practice subject to contract termination.

9.8 The Contractor shall conform to the sustainable procurement contractual provisions, if and as specified in the SCC.

10. Procuring Entity's Responsibilities

10

10.1 All information and/or data to be supplied by the Procuring Entity as described in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity, shall be deemed to be accurate, except when the Procuring Entity expressly states otherwise.

10.2 The Procuring Entity shall be responsible for acquiring and providing legal and physical possession of the Site and access thereto, and for providing possession of and access to all other areas reasonably required for the proper execution of the Contract, including all requisite rights of way, as specified in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity. The Procuring Entity shall give full possession of an accord all rights of access there to on or before the date (s) specified in that Appendix.

10.3 The Procuring Entity shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service under takings in the country where; a) The Site is located which such authorities or under takings require the Procuring Entity to obtain in the Procuring Entity's name, (b) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Procuring Entity of their respective obligations under the Contract, and (c) are specified in the Appendix (Scope of Works and Supply by the Procuring Entity).

10.4 If requested by the Contractor, the Procuring Entity shall use its best endeavours to assist the Contractor in obtaining in a timely and expeditious manner all permits, approvals and/or licenses necessary for the execution of the Contract from all local, state or national government authorities or public service under takings that such authorities or undertakings require the Contractor or Subcontractors or the personnel of the Contractor or Subcontractors, as the case may be, to obtain.

10.5 Unless otherwise specified in the Contract or agreed upon by the Procuring Entity and the Contractor, the Procuring Entity shall provide sufficient, properly qualified operating and maintenance personnel; shall supply and make available all raw materials, utilities, lubricants, chemicals, catalysts, other materials and facilities; and shall perform all work and services of whatsoever nature, including those required by the Contractor to properly carry out Pre-commissioning, Commissioning and Guarantee Tests, all in accordance with the provisions of the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity, at or before the time specified in the program furnished by the Contractor under GCC Sub-Clause18.2 hereof and in the manner thereupon specified or as otherwise agreed upon by the Procuring Entity and the Contractor.

10.6 The Procuring Entity shall be responsible for the continued operation of the Facilities after Completion, in accordance with GCC Sub-Clause 24.8, and shall be responsible for facilitating the Guarantee Test (s) for the Facilities, in accordance with GCC Sub-Clause 25.2.

10.7 All costs and expenses involved in the performance of the obligations under this GCC Clause 10 shall be the responsibility of the Procuring Entity, save those to be incurred by the Contractor with respect to the performance of Guarantee Tests, in accordance with GCC Sub-Clause25.2.

10.8 In the event that the Procuring Entity shall be in breach of any of his obligations under this Clause, the additional cost incurred by the Contractor in consequence there of shall be determined by the Project Manager and added to the Contract Price.

C. Payment

11. Contract Price

11

11.1 Contract as specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement.

11.2 Unless an adjustment clause is provided for in the SCC, the Contract Price shall be a firm lump sum not subject to any alteration, except in the event of a Change in the Facilities or as otherwise provided in the Contract.

11.3 Subject to GCC Sub-Clauses 9.2,10.1 and 35 hereof, the Contractor shall be deemed to have satisfied itself as to the correctness and sufficiency of the Contract Price, which shall, except as otherwise provided for in the Contract, cover all its obligations under the Contract.

12. Terms of Payment

12

12.1 The Contract Price shall be paid as specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement and in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, which also outlines the procedures to be followed in making application for and processing payments.

12.2 No payment made by the Procuring Entity herein shall be deemed to constitute acceptance by the Procuring Entity of the Facilities or any part (s) thereof.

12.3 In the event that the Procuring Entity fails to make any payment by its respective due date or within the period set for thin the Contract, the Procuring Entity shall pay to the Contractor interest on the amount of such delayed payment at the rate(s) shown in the Appendix to the Contract Agreement titled

Terms and Procedures of Payment, for the period of delay until payment has been made in full, whether before or after judgment or arbitrage award.

12.4 The currency or currencies in which payments are made to the Contractor under this Contract shall be specified in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, subject to the general principle that payments will be made in the currency or currencies in which the Contract Price has been stated in the Contractor's Tender.

13. Securities

13

13.1 Issuance of Securities

The Contractor shall provide the securities specified below in favour of the Procuring Entity at the times, and in the amount, manner and form specified below.

13.2 Advance Payment Security

13.2.1 The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security in an amount equal to the advance payment calculated in accordance with the Appendix to the Contract Agreement titled Terms and Procedures of Payment, and in the same currency or currencies.

13.2.2 The security shall be in the form provided in the Tendering documents or in another form acceptable to the Procuring Entity. The amount of the security shall be reduced in proportion to the value of the Facilities executed by and paid to the Contractor from time to time, and shall automatically become null and void when the full amount of the advance payment has been recovered by the Procuring Entity. The security shall be returned to the Contractor immediately after its expiration.

13.3 Performance Security

13.3.1 The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security for the due performance of the Contract in the amount specified in the **SCC**.

13.3.2 The Performance Security shall be denominated in the currency or currencies of the Contract, or in a freely convertible currency acceptable to the Procuring Entity, and shall be in the form provided in Section X, Contract Forms, corresponding to the type of bank guarantee stipulated by the Procuring Entity in the **SCC**, or in another form acceptable to the Procuring Entity.

13.3.3 Unless otherwise specified in the **SCC**, the security shall be reduced by half on the date of the Operational Acceptance. The Security shall become null and void, or shall be reduced prorata to the Contract Price of a part of the Facilities for which a separate Time for Completion is provided, five hundred and forty (540) days after Completion of the Facilities or three hundred and sixty five (365) days after Operational Acceptance of the Facilities, whichever occurs first; provided, however, that if the Defects Liability Period has been extended on any part of the Facilities pursuant to GCC Sub-Clause27.8 hereof, the Contractor shall issue an additional security in an amount proportionate to the Contract Price of that part. The security shall be returned to the Contractor immediately after its expiration, provided, however, that if the Contractor, pursuant to GCC Sub- Clause 27.10, is liable for an extended defect liability obligation, the Performance Security shall be extended for the period specified in the **SCC** pursuant to GCC Sub-Clause 27.10 and up to the amount specified in the **SCC**.

13.3.4 The Procuring Entity shall not make a claim under the Performance Security, except for amounts to which the Procuring Entity is entitled under the Contract. The Procuring Entity shall indemnify and hold

the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Procuring Entity was not entitled to make the claim.

14. Taxes and Duties

14

14.1 Except as otherwise specifically provided in the Contract, the Contractor shall bear and pay all taxes, duties, levies and charges assessed on the Contractor, its Subcontractors or their employees by all municipal, state or national government authorities in connection with the Facilities in and outside of the country where the Site is located.

14.2 If any tax exemptions, reductions, allowances or privileges may be available to the Contractor in Kenya, the Procuring Entity shall use its best endeavours to enable the Contractor to benefit from any such tax savings to the maximum allowable extent.

14.3 For the purpose of the Contract, it is agreed that the Contract Price specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement is based on the taxes, duties, levies and charges prevailing at the date twenty-eight (28) days prior to the date of Tender submission in Kenya (hereinafter called "Tax" in this GCC Sub-Clause14.4). If any rates of Tax are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation or application of any Tax occurs in the course of the performance of Contract, which was or will be assessed on the Contractor, Subcontractors or their employees in connection with performance of the Contract, an equitable adjustment of the Contract Price shall be made to fully take in to account any such change by addition to the Contract Price or deduction therefrom, as the case may be, in accordance with GCC Clause36 hereof.

A. Intellectual Property

15. License/Use of Technical Information

15

15.1 For the operation and maintenance of the Plant, the Contractor hereby grants a non-exclusive and non- transferable license (without the right to sub-license) to the Procuring Entity under the patents, utility models or other industrial property rights owned by the Contractor or by a third Party from whom the Contractor has received the right to grant licenses there under, and shall also grant to the Procuring Entity a non-exclusive and non-transferable right (without the right to sub-license) to use the know-how and other technical information disclosed to the Procuring Entity under the Contract. Nothing contained herein shall be construed as transferring ownership of any patent, utility model, trademark, design, copyright, know-how or other intellectual property right from the Contractor or any third Party to the Procuring Entity.

15.2 The copy right in all drawings, documents and other materials containing data and information furnished to the Procuring Entity by the Contractor here in shall remain vested in the Contractor or, if they are furnished to the Procuring Entity directly or through the Contractor by any third Party, including suppliers of materials, the copy right in such materials shall remain vested in such third Party.

16. Confidential Information

16

16.1 The Procuring Entity and the Contractor shall keep confidential and shall not, without the written

consent of the other Party hereto, divulge to any third Party any documents, data or other information furnished directly or indirectly by the other Party hereto in connection with the Contract, whether such information has been furnished prior to, during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor (s) such documents, data and other information it receives from the Procuring Entity to the extent required for the Subcontractor (s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor (s) an under taking of confidentiality similar to that imposed on the Contractor under this GCC Clause16.

16.2 The Procuring Entity shall not use such documents, data and other information received from the Contractor for any purpose other than the operation and maintenance of the Facilities. Similarly, the Contractor shall not use such documents, data and other information received from the Procuring Entity for any purpose other than the design, procurement of Plant, construction or such other work and services as are required for the performance of the Contract.

16.3 The obligation of a Party under GCC Sub-Clauses 16.1 and 16.2 above, however, shall not apply to that information which

a Now or here after enters the public domain through no fault of that Party
b can be proven to have been possessed by that Party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other Party hereto
c otherwise lawfully becomes available to that Party from a third Party that has no obligation of confidentiality.

16.4 The above provisions of this GCC Clause 16 shall not in any way modify any undertaking of confidentiality given by either of the Parties hereto prior to the date of the Contract in respect of the Facilities or any part thereof.

16.5 The provisions of this GCC Clause 16 shall survive termination, for whatever reason, of the Contract.

B. Execution of the Facilities

17. Representatives

17

17.1 Project Manager

If the Project Manager is not named in the Contract, then within fourteen (14) days of the Effective Date, the Procuring Entity shall appoint and notify the Contractor in writing of the name of the Project Manager. The Procuring Entity may from time to time appoint some other person as the Project Manager in place of the person previously so appointed, and shall give a notice of the name of such other person to the Contractor without delay. No such appointment shall be made at such a time or in such a manner as to impede the progress of work on the Facilities. Such appointment shall only take effect upon receipt of such notice by the Contractor. The Project Manager shall represent and act for the Procuring Entity at all times during the performance of the Contract. All notices, instructions, orders, certificates, approvals and all other communications under the Contract shall be given by the Project Manager, except as here in otherwise provided.

All notices, instructions, information and other communications given by the Contractor to the Procuring Entity under the Contract shall be given to the Project Manager, except as herein otherwise provided.

17.2 Contractor's Representative & Construction Manager

17.2.1 If the Contractor's Representative is not named in the Contract, then within fourteen (14) days of

the Effective Date, the Contractor shall appoint the Contractor's Representative and shall request the Procuring Entity in writing to approve the person so appointed. If the Procuring Entity makes no objection to the appointment within fourteen (14) days, the Contractor's Representative shall be deemed to have been approved. If the Procuring Entity objects to the appointment within fourteen (14) days giving the reason therefor, then the Contractor shall appoint a replacement within fourteen (14) days of such objection, and the foregoing provisions of this GCC Sub-Clause17.2.1 shall apply thereto.

17.2.2 The Contractor's Representative shall represent and act for the Contractor at all times during the performance of the Contract and shall give to the Project Manager all the Contractor's notices, instructions, information and all other communications under the Contract.

17.2.3 All notices, instructions, information and all other communications given by the Procuring Entity or the Project Manager to the Contractor under the Contract shall be given to the Contractor's Representative or, in its absence, its deputy, except as herein otherwise provided.

17.2.4 The Contractor shall not revoke the appointment of the Contractor's Representative without the Procuring Entity's prior written consent, which shall not be unreasonably withheld. If the Procuring Entity consents thereto, the Contractor shall appoint some other person as the Contractor's Representative, pursuant to the procedure set out in GCC Sub-Clause 17.2.1.

17.2.5 The Contractor's Representative may, subject to the approval of the Procuring Entity which shall not be unreasonably withheld, at any time delegate to any person any of the powers, functions and authorities vested in him or her. Any such delegation may be revoked at any time. Any such delegation or revocation shall be subject to a prior notice signed by the Contractor's Representative, and shall specify the powers, functions and authorities there by delegated or revoked. No such delegation or revocation shall take effect unless and until a copy there of has been delivered to the Procuring Entity and the Project Manager.

17.2.6 Any actor exercise by any person of powers, functions and authorities so delegated to him or her in accordance with this GCC Sub-Clause 17.2.3 shall be deemed to be an actor exercise by the Contractor's Representative.

17.2.7 From the commencement of installation of the Facilities at the Site until Completion, the Contractor's Representative shall appoint a suitable person as the Construction Manager. The Construction Manager shall supervise all work done at the Site by the Contractor and shall be present at the Site throughout normal working hours except when on leave, sick or absent for reasons connected with the proper performance of the Contract. Whenever the Construction Manager is absent from the Site, a suitable person shall be appointed to act as the Construction Manager's deputy.

17.2.8 The Procuring Entity may by notice to the Contractor object to any representative or person employed by the Contractor in the execution of the Contract who, in the reasonable opinion of the Procuring Entity, may be have inappropriately, may be incompetent or negligent, or may commit a serious breach of the Site regulations provided under GCC Sub-Clause 22.4. The Procuring Entity shall provide evidence of the same, where upon the Contractor shall remove such person from the Facilities.

17.2.9 If any representative or person employed by the Contractor is removed in accordance with GCC Sub-Clause 17.2.5, the Contractor shall, where required, promptly appoint a replacement.

18. Work Program

18.1 Contractor's Organization

The Contractor shall supply to the Procuring Entity and the Project Manager a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities within twenty-one

(21) days of the Effective Date. The chart shall include the identities of the key personnel and the curricula vitae of such key personnel to be employed shall be supplied together with the chart. The Contractor shall promptly inform the Procuring Entity and the Project Manager in writing of any revision or alteration of such an organization chart.

18.2 Program of Performance

Within twenty-eight (28) days after the Effective Date, the Contractor shall submit to the Project Manager a detailed program of performance of the Contract, made in a form acceptable to the Project Manager and showing the sequence in which it proposes to design, manufacture, transport, assemble, install and pre- commission the Facilities, as well as the date by which the Contractor reasonably requires that the Procuring Entity shall have fulfilled its obligations under the Contract so as to enable the Contractor to execute the Contract in accordance with the program and to achieve Completion, Commissioning and Acceptance of the Facilities in accordance with the Contract. The program so submitted by the Contractor shall accord with the Time Schedule included in the Appendix to the Contract Agreement titled Time Schedule, and any other dates and periods specified in the Contract. The Contractor shall update and revise the program as and when appropriate or when required by the Project Manager, but without modification in the Times for Completion specified in the **SCC** pursuant to Sub-Clause 8.2 and any extension granted in accordance with GCC Clause 40, and shall submit all such revisions to the Project Manager.

18.3 Progress Report

The Contractor shall monitor progress of all the activities specified in the program referred to in GCC Sub-Clause 18.2 above, and supply a progress report to the Project Manager every month.

The progress report shall be in a form acceptable to the Project Manager and shall indicate: (a) percentage completion achieved compared with the planned percentage completion for each activity; and (b) where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken.

18.4 Progress of Performance

If at any time the Contractor's actual progress falls behind the program referred to in GCC Sub-Clause 18.2, or it becomes apparent that it wills of all behind, the Contractor shall, at the request of the Procuring Entity or the project Manager, prepare and submit to the Project Manager a revised program, taking into account the prevailing circumstances, and shall notify the Project Manager of the steps being taken to expedite progress so as to attain Completion of the Facilities within the Time for Completion under GCC Sub-Clause 8.2, any extension thereof entitled under GCC Sub-Clause 40.1, or any extended period as may otherwise be agreed upon between the Procuring Entity and the Contractor.

18.5 Procedures

The Contract shall be executed in accordance with the Contract Documents including the procedures given in the Forms and Procedures of the Procuring Entity's Requirements.

The Contractor may execute the Contract in accordance with its own standard project execution plans and procedures to the extent that they do not conflict with the provisions contained in the Contract.

19 Subcontracting

19.1 The Appendix to the Contract Agreement titled List of Major Items of Plant and Installation Services and List of Approved Subcontractors, specifies major items of supply or services and a list of

approved Subcontractors against each item, including manufacturers. In so far as no Subcontractors are listed against any such item, the Contractor shall prepare a list of Subcontractors for such item for inclusion in such list. The Contractor may from time to time propose any addition to or deletion from any such list. The Contractor shall submit any such list or any modification thereto to the Procuring Entity for its approval in sufficient time so as not to impede the progress of work on the Facilities. Such approval by the Procuring Entity for any of the Subcontractors shall not relieve the Contractor from any of its obligations, duties or responsibilities under the Contract.

19.2 The Contractor shall select and employ its Subcontractors for such major items from those listed in the lists referred to in GCC Sub-Clause19.1.

19.3 For items or parts of the Facilities not specified in the Appendix to the Contract Agreement titled List of Major Items of Plant and Installation Services and List of Approved Subcontractors, the Contractor may employ such Subcontractors as it may select, at its discretion.

19.4 Each sub-contract shall include provisions which would entitle the Procuring Entity to require the sub-contract to be assigned to the Procuring Entity under GCC19.5 (if and when applicable), or in event of termination by the Procuring Entity under GCC 42.2.

19.5 If a subcontractor's obligations extend beyond the expiry date of the relevant Defects Liability Period and the Project Manager, prior to that date, instructs the Contractor to assign the benefits of such obligations to the Procuring Entity, then the Contractor shall do so.

20 Design and Engineering

20.1 Specifications and Drawings

20.1.1 The Contractor shall execute the basic and detailed design and the engineering work in compliance with the provisions of the Contract, or where not so specified, in accordance with good engineering practice.

20.1.2 The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared, whether such specifications, drawings and other documents have been approved by the Project Manager or not, provided that such discrepancies, errors or omissions are not because of inaccurate information furnished in writing to the Contractor by or on behalf of the Procuring Entity.

20.1.2 The Contractor shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designated by or on behalf of the Procuring Entity, by giving a notice of such disclaimer to the Project Manager.

20.2 Codes and Standards

Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be executed, the edition or the revised version of such codes and standards current at the date twenty-eight (28) days prior to date of Tender submission shall apply unless otherwise specified. During Contract execution, any changes in such codes and standards shall be applied subject to approval by the Procuring Entity and shall be treated in accordance with GCC Clause 39.

20.3 Approval/ Review of Technical Documents by Project Manager.

20.3.1 The Contractor shall prepare or cause its Subcontractors to prepare, and furnish to the Project

Manager the documents listed in the Appendix to the Contract Agreement titled List of Documents for Approval or Review, for its approval or review as specified and in accordance with the requirements of GCC Sub-Clause 18.2 (Program of Performance).

20.3.2 Any part of the Facilities covered by or related to the documents to be approved by the Project Manager shall be executed only after the Project Manager's approval thereof.

GCC Sub-Clauses 20.3.2 through 20.3.7 shall apply to those documents requiring the Project Manager's approval, but not to those furnished to the Project Manager for its review only.

20.2.3 Within fourteen (14) days after receipt by the Project Manager of any document requiring the Project Manager's approval in accordance with GCC Sub-Clause 20.3.1, the Project Manager shall either return one copy thereof to the Contractor with its approval endorsed there on or shall notify the Contractor in writing of its disapproval thereof and the reasons therefor and the modifications that the Project Manager proposes.
If the Project Manager fails to take such action within the said fourteen (14) days, then the said document shall be deemed to have been approved by the Project Manager.

20.3.4 The Project Manager shall not disapprove any document, except on the grounds that the document does not comply with the Contractor that it is contrary to good engineering practice.

20.3.5 If the Project Manager disapproves the document, the Contractor shall modify the document and resubmit it for the Project Manager's approval in accordance with GCC Sub-Clause 20.3.2. If the Project Manager approves the document subject to modification(s), the Contractor shall make the required modification (s), where upon the document shall be deemed to have been approved.

20.3.6 If any dispute or difference occurs between the Procuring Entity and the Contractor in connection with or arising out of the disapproval by the Project Manager of any document and/or any modification (s) there to that cannot be settled between the Parties within a reasonable period, then such dispute or difference may be referred to a Dispute Board for determination in accordance with GCC Sub-Clause 46.1 hereof. If such dispute or difference is referred to a Dispute Board, the Project Manager shall give instructions as to whether and if so, how, performance of the Contract is to proceed. The Contractor shall proceed with the Contract in accordance with the Project Manager's instructions, provided that if the Dispute Board upholds the Contractor's view on the dispute and if the Procuring Entity has not given notice under GCC Sub-Clause 46.3 hereof, then the Contractor shall be reimbursed by the Procuring Entity for any additional costs incurred by reason of such instructions and shall be relieved of such responsibility or liability in connection with the dispute and the execution of the instructions as the Dispute Board shall decide, and the Time for Completion shall be extended accordingly.

20.3.7 The Project Manager's approval, with or without modification of the document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Project Manager.

20.3.8 The Contractor shall not depart from any approved document unless the Contractor has first submitted to the Project Manager an amended document and obtained the Project Manager's approval thereof, pursuant to the provisions of this GCC Sub-Clause 20.3.

If the Project Manager requests any change in any already approved document and/or in any document based there on, the provisions of GCC Clause 39 shall apply to such request.

21 Procurement

21.1 Plant

Subject to GCC Sub-Clause 14.2, the Contractor shall procure and transport all Plant in an expeditious and orderly manner to the Site.

21.2 Procuring Entity-Supplied Plant

If the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity, provides that the Procuring Entity shall furnish any specific items to the Contractor, the following provisions shall apply:

21.2.1 The Procuring Entity shall, at its own risk and expense, transport each item to the place on or near the Site as agreed upon by the Parties and make such item available to the Contractor at the time specified in the program furnished by the Contractor, pursuant to GCC Sub-Clause18.2, unless otherwise mutually agreed.

21.2.2 Upon receipt of such item, the Contractor shall inspect the same visually and notify the Project Manager of any detected shortage, defect or default. The Procuring Entity shall immediately remedy any shortage, defector default, or the Contractor shall, if practicable and possible, at the request of the Procuring Entity, remedy such shortage, defect or default at the Procuring Entity's cost and expense. After inspection, such item shall fall under the care, custody and control of the Contractor. The provision of this GCC Sub-Clause21.2.2 shall apply to any item supplied to remedy any such shortage or default or to substitute for any defective item, or shall apply to defective items that have been repaired.

21.2.3 The foregoing responsibilities of the Contractor and its obligations of care, custody and control shall not relieve the Procuring Entity of liability for any undetected shortage, defect or default, nor place the Contractor under any liability for any such shortage, defect or default whether under GCC Clause 27 or under any other provision of Contract.

21.3 Transportation

21.3.1 The Contractor shall at its own risk and expense transport all the materials and the Contractor's Equipment to the Site by the mode of transport that the Contractor judges most suitable under all the circumstances.

21.3.2 Unless otherwise provided in the Contract, the Contractor shall be entitled to select any safe mode of transport operated by any person to carry the materials and the Contractor's Equipment.

21.3.3 Upon dispatch of each shipment of materials and the Contractor's Equipment, the Contractor shall notify the Procuring Entity by telex, cable, facsimile or electronic means, of the description of the materials and of the Contractor's Equipment, the point and means of dispatch, and the estimated time and point of arrival in the Kenya, if applicable, and at the Site. The Contractor shall furnish the Procuring Entity with relevant shipping documents to be agreed upon between the Parties.

21.3.4 The Contractor shall be responsible for obtaining, if necessary, approvals from the authorities for transportation of the materials and the Contractor's Equipment to the Site. The Procuring Entity shall use its best endeavours in a timely and expeditious manner to assist the Contractor in obtaining such approvals, if requested by the Contractor. The Contractor shall indemnify and hold harmless the Procuring Entity from and against any claim for damage to roads, bridges or any other traffic facilities that may be caused by the transport of the materials and the Contractor's Equipment to the Site.

21.4 Customs Clearance

21.4.1 The Contractor shall, at its own expense, handle all imported materials and Contractor's Equipment at the point(s) of import and shall handle any formalities for customs clearance, subject to the

Procuring Entity's obligations under GCC Sub-Clause 14.2, provided that if applicable laws or regulations require any application or act to be made by or in the name of the Procuring Entity, the Procuring Entity shall take all necessary steps to comply with such laws or regulations. In the event of delays in customs clearance that are not the fault of the Contractor, the Contractor shall be entitled to an extension in the Time for Completion, pursuant to GCC Clause40.

22 Installation

22

22.1 Setting Out/ Supervision

22.1.1 Bench Mark: The Contractor shall be responsible for the true and proper setting-out of the Facilities in relation to bench marks, reference marks and lines provided to it in writing by or on behalf of the Procuring Entity.

If, at any time during the progress of installation of the Facilities, any error shall appear in the position, level or alignment of the Facilities, the Contractor shall forth with notify the Project Manager of such error and, at its own expense, immediately rectify such error to the reasonable satisfaction of the Project Manager. If such error is based on incorrect data provided in writing by or on behalf of the Procuring Entity, the expense of rectifying the same shall be borne by the Procuring Entity.

22.1.2 Contractor's Supervision: The Contractor shall give or provide all necessary superintendence during the installation of the Facilities, and the Construction Manager or its deputy shall be constantly on the Site to provide full-time super-intendance of the installation. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand.

22.2 Labour:

22.2.1 Engagement of Staff and Labour

Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, housing, feeding and transport.

The Contractor shall provide and employ on the Site in the installation of the Facilities such skilled, semi- skilled and unskilled labour as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged to use local labour that has the necessary skills.

The Contractor shall be responsible for obtaining all necessary permit(s) and/or visa(s) from the appropriate authorities for the entry of all labour and personnel to be employed on the Site into Kenya. The Procuring Entity will, if requested by the Contractor, use his best endeavours in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national or government permission required for bringing in the Contractor's personnel.

The Contractor shall at its own expense provide the means of repatriation to all of its and its Subcontractor's personnel employed on the Contract at the Site to the place where they were recruited or to their domicile. It shall also provide suitable temporary maintenance of all such persons from the cessation of their employment on the Contract to the date programmed for their departure. In the event that the Contractor defaults in providing such means of transportation and temporary maintenance, the Procuring Entity may provide the same to such personnel and recover the cost of doing so from the Contractor.

22.2.2 Persons in the Service of Procuring Entity

The Contractor shall not recruit, or attempt to recruit, staff and labour from amongst the Procuring Entity's Personnel.

22.2.3 Labour Laws

The Contractor shall comply with all the relevant labour Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

The Contractor shall at all times during the progress of the Contract use its best endeavours to prevent any unlawful, riotous or disorderly conduct or behaviour by or amongst its employees and the labour of its Subcontractors.

The Contractor shall, in all dealings with its labour and the labour of its Subcontractors currently employed on or connected with the Contract, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labour.

22.2.4 Rates of Wages and Conditions of Labour

The Contractor shall pay rates of wages, and observe conditions of labour, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by Procuring Entities whose trade or industry is similar to that of the Contractor.

The Contractor shall in form the Contractor's Personnel about their liability to pay personal income taxes in the Country in respect of such of their salaries, wages and allowances as are chargeable under the Laws for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.

22.2.5 Working Hours

No work shall be carried out on the Site on locally recognized days of rest, or outside the normal working hours stated in the **SCC**, unless:

a Otherwise stated in the Contract,

b The Project Manager gives consent, or

c The work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Project Manager.

If and when the Contractor considers it necessary to carryout work at night or on public holidays so as to meet the Time for Completion and requests the Project Manager's consent thereto, the Project Manager shall not unreasonably withhold such consent.

This Sub-Clause shall not apply to any work which is customarily carried out by rotary or double-shifts.

22.2.6 Facilities for Staff and Labour

Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide facilities for the Procuring Entity's Personnel as stated in the Specification.
The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.

22.2.7 Health and Safety

The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Procuring Entity's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the performance of the Contract, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

The Contractor shall send to the Project Manager, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Project Manager may reasonably require.

The Contractor shall throughout the contract (including the Defects Notification Period): (i) conduct Information, Education and Consultation Communication (IEC) campaigns, at least every other month, addressed to all the Site staff and labour (including all the Contractor's employees, all Subcontractors and Procuring Entity's and Project Manager's' employees, and all truck drivers and crew making deliveries to Site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behaviour with respect to of Sexually Transmitted Diseases (STD) - or Sexually Transmitted Infections (STI) in general and HIV/AIDS in particular; (ii) provide male or female condoms for all Site staff and labour as appropriate; and (iii) provide for STI and HIV/AIDS screening, diagnosis, counselling and referral to a dedicated national STI and HIV/AIDS program,(unless otherwise agreed) of all Site staff and labour.

The Contractor shall include in the program to be submitted for the execution of the Facilities under Sub- Clause18.2 an alleviation program for Site staff and labour and their families in respect of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS. The STI, STD and HIV/AIDS alleviation program shall indicate when, how and at what cost the Contractor plans to satisfy the requirements of this Sub-Clause and the related specification. For each component, the program shall detail the resources to be provided or utilized and any related sub-contracting proposed. The program shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation this program shall not exceed the Provisional Sum dedicated for this purpose.

22.2.8 Funeral Arrangements

In the event of the death of any of the Contractor's personnel or accompanying members of their families, the Contractor shall be responsible for making the appropriate arrangements for their return or burial, unless otherwise specified in the **SCC**.

22.2.9 Records of Contractor's Personnel

The Contractor shall keep accurate records of the Contractor's personnel, including the number of each class of Contractor's Personnel on the Site and the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis in a form approved by the Project Manager and shall be available for inspection by the Project Manager until the Contractor has completed all work.

22.2.10 Supply of Food stuffs

The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.

22.2.11 Supply of Water

The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.

22.2.12 Measures against Insect and Pest Nuisance

The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce their danger to health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.

22.2.13 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Laws of Kenya, import, sell, give barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift barter or disposal by Contractor's Personnel.

22.2.14 Arms and Ammunition

The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.

22.2.15 Prohibition of All Forms of Forced or Compulsory Labour

The contractor shall not employ “forced or compulsory labour” in any form. “Forced or compulsory labour” consists of all work or service, not voluntarily performed, that is extracted from an individual under threat of force or penalty.

22.2.16 Prohibition of Harmful Child Labour

The Contractor shall not employ any child to perform any work that is economically exploitative, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.

22.3 Contractor's Equipment

22.3.1 All Contractor's Equipment brought by the Contractor on to the Site shall be deemed to be intended to be used exclusively for the execution of the Contract. The Contractor shall not remove the same from the Site without the Project Manager's consent that such Contractor's Equipment is no longer required for the execution of the Contract.

22.3.2 Unless otherwise specified in the Contract, upon completion of the Facilities, the Contractor shall remove from the Site all Equipment brought by the Contractor on to the Site and any surplus materials remaining there on.

22.3.3 The Procuring Entity will, if requested, use its best endeavours to assist the Contractor in obtaining any local, state or national government permission required by the Contractor for the export of the Contractor's Equipment imported by the Contractor for use in the execution of the Contract that is no longer required for the execution of the Contract.

22.4 Site Regulations and Safety

The Procuring Entity and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply there with. The Contractor shall prepare and submit to the Procuring Entity, with a copy to the Project Manager, proposed Site regulations for the Procuring Entity's approval, which approval shall not be unreasonably withheld.

Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care, and fire prevention.

22.5 Opportunities for Other Contractors

22.5.1 The Contractor shall, upon written request from the Procuring Entity or the Project Manager, give all reasonable opportunities for carrying out the work to any other contractors employed by the Procuring Entity on or near the Site.

22.5.2 If the Contractor, upon written request from the Procuring Entity or the Project Manager, makes available to other contractors any roads or ways the maintenance for which the Contractor is responsible, permits the use by such other contractors of the Contractor's Equipment, or provides any other service of whatsoever nature for such other contractors, the Procuring Entity shall fully compensate the Contractor for any loss or damage caused or occasioned by such other contractors in respect of any such use or service, and shall pay to the Contractor reasonable remuneration for the use of such equipment or the provision of such services.

22.5.3 The Contractor shall also so arrange to perform its work as to minimize, to the extent possible, interference with the work of other contractors. The Project Manager shall determine the resolution of any difference or conflict that may arise between the Contractor and other contractors and the workers of the Procuring Entity in regard to their work.

22.5.4 The Contractor shall notify the Project Manager promptly of any defects in the other contractors' work that come to its notice, and that could affect the Contractor's work. The Project Manager shall determine the corrective measures, if any, required to rectify the situation after inspection of the Facilities. Decisions made by the Project Manager shall be binding on the Contractor.

22.6 Emergency Work

If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work.

If the Contractor is unable or unwilling to do such work immediately, the Procuring Entity may door cause such work to be done as the Procuring Entity may determine is necessary in order to prevent damage to the Facilities. In such event the Procuring Entity shall, as soon as practicable after the occurrence of any such emergency, notify the Contractor in writing of such emergency, the work done and the reasons there for. If the work done or caused to be done by the Procuring Entity is work that the Contractor was liable to do at its own expense under the Contract, the reasonable costs incurred by the Procuring Entity in connection there with shall be paid by the Contractor to the Procuring Entity. Otherwise, the cost of such remedial work shall be borne by the Procuring Entity.

22.7 Site Clearance

22.7.1 Site Clearance in Course of Performance: In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, rubbish or temporary works from the Site, and remove

any Contractor's Equipment no longer required for execution of the Contract.

22.7.2 Clearance of Site after Completion: After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site and Facilities in a clean and safe condition.

22.8 Watching and Lighting

The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of adjacent property and for the safety of the public.

23 Test and Inspection

23

23.1 The Contractor shall at its own expense carryout at the place of manufacture and/or on the Site all such tests and/ or inspections of the Plant and any part of the Facilities as are specified in the Contract.

23.2 The Procuring Entity and the Project Manager or their designated representatives shall be entitled to attend the afore said test and/ or inspection, provided that the Procuring Entity shall bear all costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses.

23.3 Whenever the Contractor is ready to carry out any such test and/or inspection, the Contractor shall give a reasonable advance notice of such test and/or inspection and of the place and time thereof to the Project Manager.TheContractorshallobtainfromanyrelevantthirdPartyormanufactureranynecessarypermission or consent to enable the Procuring Entity and the Project Manager or their designated representatives to attend the test and/ or inspection.

23.4 The Contractor shall provide the Project Manager with a certified report of the results of any such test and/ or inspection. If the Procuring Entity or Project Manager or their designated representatives fails to attend the test and/or inspection, or if it is agreed between the Parties that such persons shall not do so, then the Contractor may proceed with the test and/ or inspection in the absence of such persons, and may provide the Project Manager with a certified report of the results thereof.

23.5 The Project Manager may require the Contractor to carry out any test and/or inspection not required by the Contract, provided that the Contractor's reasonable costs and expenses incurred in the carrying out of such test and/or inspection shall be added to the Contract Price. Further, if such test and/or inspection impede the progress of work on the Facilities and/or the Contractor's performance of its other obligations under the Contract, due allowance will be made in respect of the Time for Completion and the other obligations so affected.

23.6 If any Plant or any part of the Facilities fails to pass any test and/ or inspection, the Contractor shall either rectify or replace such Plant or part of the Facilities and shall repeat the test and/or inspection upon giving a notice under GCC Sub-Clause 23.3.

23.7 If any dispute or difference of opinion shall arise between the Parties in connection with or arising out of the test and/or inspection of the Plant or part of the Facilities that cannot be settled between the Parties within a reasonable period of time, it may be referred to a Dispute Board for determination in accordance with GCC Sub-Clause 46.3.

23.8 The Contractor shall afford the Procuring Entity and the Project Manager, at the Procuring Entity's expense, access at any reasonable time to any place where the Plant are being manufactured or the Facilities are being installed, in order to inspect the progress and the manner of manufacture or installation, provided that the Project Manager shall give the Contractor a reasonable prior notice.

23.9 The Contractor agrees that neither the execution of a test and/ or inspection of Plant or any part of the Facilities, nor the attendance by the Procuring Entity or the Project Manager, nor the issue of any test certificate pursuant to GCC Sub-Clause 23.4, shall release the Contractor from any other responsibilities under the Contract.

23.10 No part of the Facilities or foundations shall be covered upon the Site without the Contractor carrying out any test and/or inspection required under the Contract. The Contractor shall give a reasonable notice to the Project Manager whenever any such parts of the Facilities or foundations are ready or about to be ready for test and/or inspection; such test and/or inspection and notice there of shall be subject to the requirements of the Contract.

23.11 The Contractor shall uncover any part of the Facilities or foundations, or shall make openings in or through the same as the Project Manager may from time to time require at the Site, and shall reinstate and make good such part or parts.

If any parts of the Facilities or foundations have been covered up at the Site after compliance with the requirement of GCC Sub-Clause 23.10 and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating, and making good the same shall be borne by the Procuring Entity, and the Time for Completion shall be reasonably adjusted to the extent that the contractor has thereby been delayed or impeded in the performance of any of its obligations under the Contract.

24 Completion of the Facilities

24

24.1 As soon as the Facilities or any part thereof has, in the opinion of the Contractor, been completed operationally and structurally and put in a tight and clean condition as specified in the Procuring Entity's Requirements, excluding minor items not materially affecting the operation or safety of the Facilities, the Contractor shall so notify the Procuring Entity in writing.

24.2 Within seven (7) days after receipt of the notice from the Contractor under GCC Sub-Clause 24.1, the Procuring Entity shall supply the operating and maintenance personnel specified in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity for Pre-commissioning of the Facilities or any part thereof.

24.3 Pursuant to the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity, the Procuring Entity shall also provide, within the said seven (7) day period, the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Pre-commissioning of the Facilities or any part thereof.

24.4 As soon as reasonably practicable after the operating and maintenance personnel have been supplied by the Procuring Entity and the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters have been provided by the Procuring Entity in accordance with GCC Sub-Clause24.2, the Contractor shall commence Pre-commissioning of the Facilities or the relevant part thereof in preparation for Commissioning, subject to GCC Sub-Clause 25.5.

24.5 As soon as all works in respect of Pre-commissioning are completed and, in the opinion of the Contractor, the Facilities or any part thereof is ready for Commissioning, the Contractor shall so notify

the Project Manager in writing.

24.6 The Project Manager shall, within fourteen (14) days after receipt of the Contractor's notice under GCC Sub- Clause24.4, either issue a Completion Certificate in the form specified in the Procuring Entity's Requirements (Forms and Procedures), stating that the Facilities or that part thereof have reached Completion as of the date of the Contractor's notice under GCC Sub-Clause 24.4, or notify the Contractor in writing of any defects and/or deficiencies.

If the Project Manager notifies the Contractor of any defects and/or deficiencies, the Contractor shall then correct such defects and/or deficiencies, and shall repeat the procedure described in GCC Sub-Clause 24.4.
If the Project Manager is satisfied that the Facilities or that part thereof have reached Completion, the Project Manager shall, within seven (7) days after receipt of the Contractor's repeated notice, issue a Completion Certificate stating that the Facilities or that part thereof have reached Completion as of the date of the Contractor's repeated notice.

If the Project Manager is not so satisfied, then it shall notify the Contractor in writing of any defects and/or deficiencies within seven (7) days after receipt of the Contractor's repeated notice, and the above procedure shall be repeated.

24.7 If the Project Manager fails to issue the Completion Certificate and fails to inform the Contractor of any defects and/or deficiencies within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 24.4 or within seven (7) days after receipt of the Contractor's repeated notice under GCC Sub-Clause 24.5, or if the Procuring Entity makes use of the Facilities or part thereof, then the Facilities or that part there of shall be deemed to have reached Completion as of the date of the Contractor's notice or repeated notice, or as of the Procuring Entity's use of the Facilities, as the case may be.

24.8 As soon as possible after Completion, the Contractor shall complete all outstanding minor items so that the Facilities are fully in accordance with the requirements of the Contract, failing which the Procuring Entity will undertake such completion and deduct the costs there of from any monies owing to the Contractor.

24.9 Upon Completion, the Procuring Entity shall be responsible for the care and custody of the Facilities or the relevant part thereof, together with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof.

25 Commissioning and Operational Acceptance

25.1 Commissioning

25.1.1 Commissioning of the Facilities or any part there of shall be commenced by the Contractor immediately after issue of the Completion Certificate by the Project Manager, pursuant to GCC Sub-Clause24.5, or immediately after the date of the deemed Completion, under GCC Sub-Clause 24.6.

25.1.2 The Procuring Entity shall supply the operating and maintenance personnel and all raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Commissioning.

25.1.3 In accordance with the requirements of the Contract, the Contractor's and Project Manager's

advisory personnel shall attend the Commissioning, including the Guarantee Test, and shall advise and assist the Procuring Entity.

25.2 Guarantee Test

25.2 Subject to GCC Sub-Clause 25.5, the Guarantee Test and repeats there of shall be conducted by the Contractor during Commissioning of the Facilities or the relevant part thereof to ascertain whether the Facilities or the relevant part can attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees. The Procuring Entity shall promptly provide the Contractor with such information as the Contractor may reasonably require in relation to the conduct and results of the Guarantee Test and any repeats thereof.

25.1.1 If for reasons not attributable to the Contractor, the Guarantee Test of the Facilities or the relevant part thereof cannot be successfully completed within the period from the date of Completion specified in the **SCC** or any other period agreed upon by the Procuring Entity and the Contractor, the Contractor shall be deemed to have fulfilled its obligations with respect to the Functional Guarantees, and GCC Sub-Clauses 28.2 and 28.3 shall not apply.

25.3 Operational Acceptance

25.3.1 Subject to GCC Sub-Clause 25.4 below, Operational Acceptance shall occur in respect of the Facilities or any part thereof when

a The Guarantee Test has been successfully completed and the Functional Guarantees are met; or

b the Guarantee Test has not been successfully completed or has not been carried out for reasons not attributable to the Contractor within the period from the date of Completion specified in the **SCC** pursuant to GCC Sub-Clause 25.2.2 above or any other period agreed upon by the Procuring Entity and the Contractor; or

c the Contractor has paid the liquidated damages specified in GCC Sub-Clause 28.3hereof; and

d any minor items mentioned in GCC Sub-Clause 24.7 here of relevant to the Facilities or that part thereof have been completed.

25.3.2 At any time after any of the events set out in GCC Sub-Clause 25.3.1 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Operational Acceptance Certificate in the form provided in the Procuring Entity's Requirements (Forms and Procedures) in respect of the Facilities or the part there of specified in such notice as of the date of such notice.

25.3.3 The Project Manager shall, after consultation with the Procuring Entity, and within seven (7) days after receipt of the Contractor's notice, issue an Operational Acceptance Certificate.

25.3.4 If within seven (7) days after receipt of the Contractor's notice, the Project Manager fails to issue the Operational Acceptance Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Operational Acceptance Certificate, the Facilities or the relevant part there of shall be deemed to have been accepted as of the date of the Contractor's said notice.

25.4 Partial Acceptance

25.4.1 If the Contract specifies that Completion and Commissioning shall be carried out in respect of parts of the Facilities, the provisions relating to Completion and Commissioning including the

Guarantee Test shall apply to each such part of the Facilities individually, and the Operational Acceptance Certificate shall be issued accordingly for each such part of the Facilities.

25.4.2 If a part of the Facilities comprises facilities such as buildings, for which no Commissioning or Guarantee Test is required, then the Project Manager shall issue the Operational Acceptance Certificate for such facility when it attains Completion, provided that the Contractor shall there after complete any outstanding minor items that are listed in the Operational Acceptance Certificate.

25.5 Delayed Pre-commissioning and/or Guarantee Test

25.5.1 In the event that the Contractor is unable to proceed with the Pre-commissioning of the Facilities pursuant to Sub-Clause 24.3, or with the Guarantee Test pursuant to Sub-Clause 25.2, for reasons attributable to the Procuring Entity either on account of non-availability of other facilities under the responsibilities of other contractor(s), or for reasons beyond the Contractor's control, the provisions leading to “deemed” completion of activities such as Completion, pursuant to GCC Sub-Clause 24.6, and Operational Acceptance, pursuant to GCC Sub-Clause 25.3.4, and Contractor's obligations regarding Defect Liability Period, pursuant to GCC Sub- Clause 27.2, Functional Guarantee, pursuant to GCC Clause 28, and Care of Facilities, pursuant to GCC Clause 32 ,and GCC Clause 41.1, Suspension, shall not apply. In this case, the following provisions shall apply.

25.5.2 When the Contractor is notified by the Project Manager that he will be unable to proceed with the activities and obligations pursuant to above Sub-Clause 25.5.1, the Contractor shall be entitled to the following:

a The Time of Completion shall be extended for the period of suspension without imposition of liquidated damages pursuant to GCC Sub-Clause 26.2;

b payments due to the Contractor in accordance with the provision specified in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, which would not have been payable in normal circumstances due to non-completion of the subject activities, shall be released to the Contractor against submission of a security in the form of a bank guarantee of equivalent amount acceptable to the Procuring Entity, and which shall become null and void when the Contractor will have complied with its obligations regarding those payments, subject to the provision of Sub-Clause 25.5.3 below;

c the expenses towards the above security and extension of other securities under the contract, of which validity needs to be extended, shall be reimbursed to the Contractor by the Procuring Entity;

d the additional charges towards the care of the Facilities pursuant to GCC Sub-Clause 32.1 shall be reimbursed to the Contractor by the Procuring Entity for the period between the notification mentioned above and the notification mentioned in Sub-Clause 25.5.4 below. The provision of GCC Sub-Clause 33.2 shall apply to the Facilities during the same period.

e Where the contract price is different from the corrected tender price, in order to ensure the contractor is not paid less or more relative to the contract price (which would be the tender price), payment valuation certificates and variation orders on omissions and additions valued based on rates in the Bill of Quantities or schedule of rates in the Tender, will be adjusted by a plus or minus percentage. The percentage already worked out during tender evaluation is worked out as follows: (corrected tender price –tender price)/ tender price X100.

25.5.3 In the event that the period of suspension under above Sub-Clause 25.5.1 actually exceeds one hundred eighty (180) days, the Procuring Entity and Contractor shall mutually agree to any additional compensation payable to the Contractor.

25.5.4 When the Contractor is notified by the Project Manager that the plant is ready for Pre-commissioning, the Contractor shall proceed without delay in performing Pre-commissioning in

accordance with Clause 24.

A. Guarantees and Liabilities

26 Completion Time Guarantee

26

26.1 The Contractor guarantees that it shall attain Completion of the Facilities (or a part for which a separate time for completion is specified) within the Time for Completion specified in the **SCC** pursuant to GCC Sub-Clause 8.2, or within such extended time to which the Contractor shall be entitled under GCC Clause 40 hereof.

26.2 If the Contractor fails to attain Completion of the Facilities or any part thereof within the Time for Completion or any extension thereof under GCC Clause 40, the Contractor shall pay to the Procuring Entity liquidated damages in the amount specified in the **SCC** as a percentage rate of the Contract Price or the relevant part thereof. The aggregate amount of such liquidated damages shall in no event exceed the amount specified as "Maximum" in the **SCC** as a percentage rate of the Contract Price. Once the "Maximum" is reached, the Procuring Entity may consider termination of the Contract, pursuant to GCC Sub-Clause 42.2.2.

26.3 Such payment shall completely satisfy the Contractor's obligation to attain Completion of the Facilities or the relevant part thereof within the Time for Completion or any extension thereof under GCC Clause 40. The Contractor shall have no further liability whatsoever to the Procuring Entity in respect thereof.

26. 4 However, the payment of liquidated damages shall not in any way relieve the Contractor from any of its obligations to complete the Facilities or from any other obligations and liabilities of the Contractor under the Contract.

26. 5 Save for liquidated damages payable under this GCC Sub-Clause 26.2, the failure by the Contractor to attain any milestone or other act, matter or thing by any date specified in the Appendix to the Contract Agreement titled Time Schedule, and/or other program of work prepared pursuant to GCC Sub-Clause 18.2 shall not render the Contractor liable for any loss or damage there by suffered by the Procuring Entity.

26.6 If the Contractor attains Completion of the Facilities or any part there of before the Time for Completion or any extension thereof under GCC Clause 40, the Procuring Entity shall pay to the Contractor a bonus in the amount specified in the **SCC**. The aggregate amount of such bonus shall in no event exceed the amount specified as "Maximum" in the **SCC**.

27 Defect Liability

27.1 The Contractor warrants that the Facilities or any part thereof shall be free from defects in the design, engineering, materials and workmanship of the Plant supplied and of the work executed.

27.2 The Defect Liability Period shall be five hundred and forty (540) days from the date of Completion of the Facilities (or any part thereof) or one year from the date of Operational Acceptance of the Facilities (or any part thereof), whichever first occurs, unless specified otherwise in the **SCC** pursuant to GCC Sub-Clause 27.10.

If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant supplied or of the work executed by the Contractor, the Contractor shall promptly, in consultation and agreement with the Procuring Entity regarding appropriate

remedying of the defects, and at its cost, repair, replace or otherwise make good as the Contractor shall determine at its discretion, such defect as well as any damage to the Facilities caused by such defect. The Contractor shall not be responsible for the repair, replacement or making good of any defector of any damage to the Facilities arising out of or resulting from any of the following causes:

a Improper operation or maintenance of the Facilities by the Procuring Entity;

b Operation of the Facilities outside specifications provided in the Contract; or

c Normal wear and tear.

27.3 The Contractor's obligations under this GCC Clause 27 shall not apply to:

a any materials that are supplied by the Procuring Entity under GCC Sub-Clause 21.2, are normally consumed in operation, or have a normal life shorter than the Defect Liability Period stated herein;

b any designs, specifications or other data designed, supplied or specified by or on behalf of the Procuring Entity or any matters for which the Contractor has disclaimed responsibility herein; or

c any other materials supplied or any other work executed by or on behalf of the Procuring Entity, except for the work executed by the Procuring Entity under GCC Sub-Clause 27.7.

27.4 The Procuring Entity shall give the Contractor a notice stating the nature of any such defect together with all available evidence thereof, promptly following the discovery thereof. The Procuring Entity shall afford all reasonable opportunity for the Contractor to inspect any such defect.

27.5 The Procuring Entity shall afford the Contractor all necessary access to the Facilities and the Site to enable the Contractor to perform its obligations under this GCC Clause 27.

The Contractor may, with the consent of the Procuring Entity, remove from the Site any Plant or any part of the Facilities that are defective if the nature of the defect, and/or any damage to the Facilities caused by the defect, is such that repairs cannot be expeditiously carried out at the Site.

27.6 If the repair, replacement or making good is of such a character that it may affect the efficiency of the Facilities or any part thereof, the Procuring Entity may give to the Contractor a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such remedial work, where upon the Contractor shall carryout such tests.

27.7 If such part fails the tests, the Contractor shall carryout further repair, replacement or making good, as the case may be, until that part of the Facilities passes such tests. The tests shall be agreed upon by the Procuring Entity and the Contractor.

27.8 If the Contractor fails to commence the work necessary to remedy such defector any damage to the Facilities caused by such defect within a reasonable time (which shall in no event be considered to be less than fifteen (15) days), the Procuring Entity may, following notice to the Contractor, proceed to do such work, and the reasonable costs incurred by the Procuring Entity in connection there with shall be paid to the Procuring Entity by the Contractor or may be deducted by the Procuring Entity from any monies due the Contractor or claimed under the Performance Security.

27.9 If the Facilities or any part thereof cannot be used by reason of such defect and/or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the Facilities or such part cannot be used by the Procuring Entity because of any of the aforesaid reasons.

27.10 Except as provided in GCC Clauses 27 and 33, the Contractor shall be under no liability whatsoever and how so ever arising, and whether under the Contractor at law, in respect of defects in the Facilities or any part thereof, the Plant, design or engineering or work executed that appear

after Completion of the Facilities or any part thereof, except where such defects are the result of the gross negligence, fraud, or criminal or wilful action of the Contractor.

27.11 In addition, any such component of the Facilities, and during the period of time as may be specified in the **SCC**, shall be subject to an extended defect liability period. Such obligation of the Contractor shall be in addition to the defect liability period specified under GCC Sub-Clause 27.2.

28 Functional Guarantees

28.1 The Contractor guarantees that during the Guarantee Test, the Facilities and all parts thereof shall attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, subject to and upon the conditions therein specified.

28.2 If, for reasons attributable to the Contractor, the minimum level of the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, are not met either in whole or in part, the Contractor shall at its cost and expense make such changes, modifications and/ or additions to the Plant or any part there of as may be necessary to meet at least the minimum level of such Guarantees. The Contractor shall notify the Procuring Entity upon completion of the necessary changes, modifications and/or additions, and shall request the Procuring Entity to repeat the Guarantee Test until the minimum level of the Guarantees has been met. If the Contractor eventually fails to meet the minimum level of Functional Guarantees, the Procuring Entity may consider termination of the Contract, pursuant to GCC Sub-Clause 42.2.2.

28.3 If, for reasons attributable to the Contractor, the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, are not attained either in whole or in part, but the minimum level of the Functional Guarantees specified in the said Appendix to the Contract Agreement is met, the Contractor shall, at the Contractor's option, either

a Make such changes, modifications and/or additions to the Facilities or any part there of that are necessary to attain the Functional Guarantees at its cost and expense, and shall request the Procuring Entity to repeat the Guarantee Test or

b Pay liquidated damages to the Procuring Entity in respect of the failure to meet the Functional Guarantees in accordance with the provisions in the Appendix to the Contract Agreement titled Functional Guarantees.

c The payment of liquidated damages under GCC Sub-Clause 28.3, up to the limitation of liability specified in the Appendix to the Contract Agreement titled Functional Guarantees, shall completely satisfy the Contractor's guarantees under GCC Sub-Clause 28.3, and the Contractor shall have no further liability whatsoever to the Procuring Entity in respect thereof. Upon the payment of such liquidated damages by the Contractor, the Project Manager shall issue the Operational Acceptance Certificate for the Facilities or any part thereof in respect of which the liquidated damages have been so paid.

29 Patent Indemnity

29.1 The Contractor shall, subject to the Procuring Entity's compliance with GCC Sub-Clause 29.2, indemnify and hold harmless the Procuring Entity and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Procuring Entity may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copy right or other intellectual property right registered or otherwise existing at the date of the Contract by reason of: (a) the installation of the Facilities by the Contractor or the use of the Facilities in Kenya; and (b) the sale of the products produced by the Facilities in any

country.

29.2 Such indemnity shall not cover any use of the Facilities or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract, any infringement resulting from the use of the Facilities or any part thereof, or any products produced thereby in association or combination with any other equipment, plant or materials not supplied by the Contractor, pursuant to the Contract Agreement.

29.3 If any proceedings are brought or any claim is made against the Procuring Entity arising out of the matters referred to in GCC Sub-Clause 29.1, the Procuring Entity shall promptly give the Contractor a notice thereof, and the Contractor may at its own expense and in the Procuring Entity's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

29.4 If the Contractor fails to notify the Procuring Entity within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Procuring Entity shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Procuring Entity within the twenty- eight (28) day period, the Procuring Entity shall make no admission that may be prejudicial to the defence of any such proceedings or claim.

29.5 The Procuring Entity shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

29.6 The Procuring Entity shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Contractor may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification, or other documents or materials provided or designed by or on behalf of the Procuring Entity.

30 Limitation of Liability

30.1 Except in cases of criminal negligence or wilful misconduct,

a) Neither Party shall be liable to the other Party, whether in contract, tort, or otherwise, for any in director consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, which may be suffered by the other Party in connection with the Contract, other than specifically provided as any obligation of the Party in the Contract, and

b) the aggregate liability of the Contractor to the Procuring Entity, whether under the Contract, in tort or otherwise, shall not exceed the amount resulting from the application of the multiplier specified in the **SCC**, to the Contract Price or, if a multiplier is not so specified, the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Contractor to indemnify the Procuring Entity with respect to patent infringement.

B. Risk Distribution

31 Transfer of Ownership

31

31.1 Ownership of the Plant (including spare parts) to be imported in to Kenya shall be transferred to the Procuring Entity upon loading on to the mode of transport to be used to convey the Plant from the country of origin to that country.

31.2 Ownership of the Plant (including spare parts) procured in Kenya shall be transferred to the Procuring Entity when the Plant are brought on to the Site.

31.3 Ownership of the Contractor's Equipment used by the Contractor and its Subcontractors in connection with the Contract shall remain with the Contractor or its Subcontractors.

31.4 Ownership of any Plant in excess of the requirements for the Facilities shall revert to the Contractor upon Completion of the Facilities or at such earlier time when the Procuring Entity and the Contractor agree that the Plant in question are no longer required for the Facilities.

31.5 Notwithstanding the transfer of ownership of the Plant, the responsibility for care and custody thereof together with the risk of loss or damage there to shall remain with the Contractor pursuant to GCC Clause 32 (Care of Facilities) hereof until Completion of the Facilities or the part there of in which such Plant are incorporated.

32 Care of Facilities

32

32.1 The Contractor shall be responsible for the care and custody of the Facilities or any part thereof until the date of Completion of the Facilities pursuant to GCC Clause 24 or, where the Contract provides for Completion of the Facilities in parts, until the date of Completion of the relevant part, and shall make good at its own cost any loss or damage that may occur to the Facilities or the relevant part thereof from any cause whatsoever during such period. The Contractor shall also be responsible for any loss or damage to the Facilities caused by the Contractor or its Subcontractors in the course of any work carried out, pursuant to GCC Clause 27. Notwithstanding the foregoing, the Contractor shall not be liable for any loss or damage to the Facilities or that part thereof caused by reason of any of the matters specified or referred to in paragraphs (a), (b) and (c) of GCC Sub-Clauses 32.2 and 38.1.

32.2 If any loss or damage occurs to the Facilities or any part, thereof or to the Contractor's temporary facilities by reason of

a insofar as they relate to Kenya, nuclear reaction, nuclear radiation, radioactive contamination, pressure wave caused by aircraft or other aerial objects, or any other occurrences that an experienced contract or could not reasonably foresee, or if reasonably foreseeable could not reasonably make provision for or insure against, in so far as such risks are not normally insurable on the insurance market and are mentioned in the general exclusions of the policy of insurance, including War Risks and Political Risks, taken out under GCC Clause 34 hereof; or

b any use or occupation by the Procuring Entity or any third Party other than a Subcontractor, authorized by the Procuring Entity of any part of the Facilities; or

c any use of or reliance upon any design, data or specification provided or designated by or on behalf of the Procuring Entity, or any such matter for which the Contractor has disclaimed responsibility herein, the Procuring Entity shall pay to the Contractor all sums payable in respect of the Facilities executed, notwithstanding that the same be lost, destroyed or damaged, and will pay to the Contractor the replacement value of all temporary facilities and all parts thereof lost, destroyed or damaged. If the Procuring Entity requests the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Contractor shall make good the same at the cost of the Procuring Entity in accordance with GCC Clause 39. If the Procuring Entity does not request the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the

Procuring Entity shall either request a change in accordance with GCC Clause 39, excluding the performance of that part of the Facilities there by lost, destroyed or damaged, or, where the loss or damage affects a substantial part of the Facilities, the Procuring Entity shall terminate the Contract pursuant to GCC Sub-Clause 42.1 hereof.

32.3 The Contractor shall be liable for any loss of or damage to any Contractor's Equipment, or any other property of the Contractor used or intended to be used for purposes of the Facilities, except (i) as mentioned in GCC Sub-Clause 32.2 with respect to the Contractor's temporary facilities, and (ii) where such loss or damage arises by reason of any of the matters specified in GCC Sub-Clauses 32.2 (b) and (c) and 38.1.

32.4 With respect to any loss or damage caused to the Facilities or any part thereof or to the Contractor's Equipment by reason of any of the matters specified in GCC Sub-Clause 38.1, the provisions of GCC Sub-Clause 38.3 shall apply.

33 Loss of or Damage to Property; Accident or Injury to Workers; Indemnification

33

33.1 Subject to GCC Sub-Clause 33.3, the Contractor shall indemnify and hold harmless the Procuring Entity and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, in respect of the death or injury of any person or loss of or damage to any property other than the Facilities whether accepted or not, arising in connection with the supply and installation of the Facilities and by reason of the negligence of the Contractor or its Subcontractors, or their employees, officers or agents, except any injury, death or property damage caused by the negligence of the Procuring Entity, its contractors, employees, officers or agents.

33.2 If any proceedings are brought or any claim is made against the Procuring Entity that might subject the Contractor to liability under GCC Sub-Clause33.1, the Procuring Entity shall promptly give the Contractor a notice thereof and the Contractor may at its own expense and in the Procuring Entity's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

33.3 If the Contractor fails to notify the Procuring Entity within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Procuring Entity shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Procuring Entity within the twenty- eight (28) day period, the Procuring Entity shall make no admission that may be prejudicial to the defence of any such proceedings or claim.

33.4 The Procuring Entity shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

33.5 `The Procuring Entity shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from any liability for loss of or damage to property of the Procuring Entity, other than the Facilities not yet taken over, that is caused by fire, explosion or any other perils, in excess of the amount recoverable from insurances procured under GCC Clause 34, provided that such fire, explosion or other perils were not caused by any actor failure of the Contractor.

33.6 The Party entitled to the benefit of an indemnity under this GCC Clause 33 shall take all reasonable measures to mitigate any loss or damage which has occurred. If the Party fails to take such measures, the other Party's liabilities shall be correspondingly reduced.

34 Insurance

34.1 To the extent specified in the Appendix to the Contract Agreement titled Insurance Requirements, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified in the said Appendix. The identity of the insurers and the form of the policies shall be subject to the approval of the Procuring Entity, who should not unreasonably withhold such approval.

a. Cargo Insurance During Transport

Covering loss or damage occurring while in transit from the Contractor's or Subcontractor's works or stores until arrival at the Site, to the Plant (including spare parts therefor) and to the Contractor's Equipment.

b. Installation All Risks Insurance

Covering physical loss or damage to the Facilities at the Site, occurring prior to Completion of the Facilities, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the Defect Liability Period while the Contractor is on the Site for the purpose of performing its obligations during the Defect Liability Period.

c. Third Party Liability Insurance

Covering bodily injury or death suffered by third Parties including the Procuring Entity's personnel, and loss of or damage to property occurring in connection with the supply and installation of the Facilities.

d. Automobile Liability Insurance

Covering use of all vehicles used by the Contractor or its Subcontractors, whether or not owned by them, in connection with the execution of the Contract.

c. Workers' Compensation

In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

d. Procuring Entity's Liability

In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

e. Other Insurances

Such other insurances as may be specifically agreed upon by the Parties here to as listed in the Appendix to the Contract Agreement titled Insurance Requirements.

34.2 The Procuring Entity shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1, except for the Third Party Liability, Workers' Compensation and Procuring Entity's Liability Insurances, and the Contractor's Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1 except for the Cargo Insurance During Transport, Workers' Compensation and Procuring Entity's Liability Insurances. All insurer's rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.

34.3 The Contractor shall, in accordance with the provisions of the Appendix to the Contract Agreement titled Insurance Requirements, deliver to the Procuring Entity certificates of insurance or copies of the insurance policies as evidence that the required policies are in full force and effect. The certificates shall provide that no less than twenty-one (21) days' notice shall be given to the Procuring Entity by insurers prior to cancellation or material modification of a policy.

34.4 The Contractor shall ensure that, where applicable, its Subcontractor(s) shall take out and maintain in effect adequate insurance policies for their personnel and vehicles and for work executed by them under the Contract, unless such Subcontractors are covered by the policies taken out by the Contractor.

34.5 The Procuring Entity shall at its expense take out and maintain in effect during the performance of the Contract those insurances specified in the Appendix to the Contract Agreement titled Insurance Requirements, in the sums and with the deductibles and other conditions specified in the said Appendix. The Contractor and the Contractor's Subcontractors shall be named as co-insureds under all such policies. All insurers' rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies. The Procuring Entity shall deliver to the Contractor satisfactory evidence that the required insurances are in full force and effect. The policies shall provide that not less than twenty-one (21) days' notice shall be given to the Contractor by all insurers prior to any cancellation or material modification of the policies. If so requested by the Contractor, the Procuring Entity shall provide copies of the policies taken out by the Procuring Entity under this GCC Sub-Clause 34.5.

34.6 If the Contractor fails to take out and/or maintain in effect the insurances referred to in GCC Sub-Clause 34.1, the Procuring Entity may take out and maintain in effect any such insurances and may from time to time deduct from any amount due the Contractor under the Contract any premium that the Procuring Entity shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Contractor. If the Procuring Entity fails to take out and/or maintain in effect the insurances referred to in GCC 34.5, the Contractor may take out and maintain in effect any such insurances and may from time to time deduct from any amount due the Procuring Entity under the Contract any premium that the Contractor shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Procuring Entity. If the Contractor fails to or is unable to take out and maintain in effect any such insurances, the Contractor shall nevertheless have no liability or responsibility towards the Procuring Entity, and the Contractor shall have full recourse against the Procuring Entity for any and all liabilities of the Procuring Entity herein.

34.7 Unless otherwise provided in the Contract, the Contractor shall prepare and conduct all and any claims made under the policies effected by it pursuant to this GCC Clause 34, and all monies payable by any insurers shall be paid to the Contractor. The Procuring Entity shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the Procuring Entity's interest is involved, the Contractor shall not give any release or make any compromise with the insurer without the prior written consent of the Procuring Entity. With respect to insurance claims in which the Contractor's interest is involved, the Procuring

Entity shall not give any release or make any compromise with the insurer without the prior written consent of the Contractor.

35. Unforeseen Conditions

35.1 If, during the execution of the Contract, the Contractor shall encounter on the Site any physical conditions other than climatic conditions, or artificial obstructions that could not have been reasonably foreseen prior to the date of the Contract Agreement by an experienced contractor on the basis of reasonable examination of the data relating to the Facilities including any data as to boring tests, provided by the Procuring Entity, and on the basis of information that it could have obtained from a visual inspection of the Site if access thereto was available, or other data readily available to it relating to the Facilities, and if the Contractor determines that it will in consequence of such conditions or obstructions incur additional cost and expense or require additional time to perform its obligations under the Contract that would not have been required if such physical conditions or artificial obstructions had not been encountered, the Contractor shall promptly, and before performing additional work or using additional Plant or Contractor's Equipment, notify the Project Manager in writing of

a) the physical conditions or artificial obstructions on the Site that could not have been reasonably foreseen;

c) the additional work and/or Plant and/or Contractor's Equipment required, including the steps which the Contractor will or proposes to take to overcome such conditions or obstructions;

d) the extent of the anticipated delay; and

d) the additional cost and expense that the Contractor is likely to incur.

On receiving any notice from the Contractor under this GCC Sub-Clause 35.1, the Project Manager shall promptly consult with the Procuring Entity and Contractor and decide upon the actions to be taken to overcome the physical

35.2 If the Contractor is delayed or impeded in the performance of the Contract because of any such physical conditions or artificial obstructions referred to in GCC Sub-Clause 35.1, the Time for Completion shall be extended in accordance with GCC Clause 40.

36. Change in Laws and Regulations

36.1 If, after the date twenty-eight (28) days prior to the date of Tender submission, in Kenya, any law, regulation, ordinance, order or by-law having the force of law is enacted, promulgated, abrogated or changed which shall be deemed to include any change in interpretation or application by the competent authorities, that subsequently affects the costs and expenses of the Contractor and/or the Time for Completion, the Contract Price shall be correspondingly increased or decreased, and/or the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been affected in the performance of any of its obligations under the Contract. Notwithstanding the foregoing, such additional or reduced costs shall not be separately paid or credited if the same has already been accounted for in the price adjustment provisions where applicable, in accordance with the **SCC** pursuant to GCC Sub-Clause 11.2.

37. Force Majeure

37.1 “Force Majeure” shall mean any event beyond the reasonable control of the Procuring Entity or of the Contractor, as the case may be, and which is unavoidable notwithstanding the reasonable care of the Party affected, and shall include, without limitation, the following:

a) war, hostilities or warlike operations whether a state of war be declared or not, invasion, act of foreign enemy and civil war

b) rebellion, revolution, insurrection, mutiny, usurpation of civil or military government, conspiracy, riot, civil commotion and terrorist acts

c) confiscation, nationalization, mobilization, commandeering or requisition by or under the order of any government or de jure or de facto authority or ruler or any other act or failure to act of any local state or national government authority

d) strike, sabotage, lockout, embargo, import restriction, port congestion, lack of usual means of public transportation and communication, industrial dispute, shipwreck, shortage or restriction of power supply, epidemics, quarantine and plague

e) earthquake, landslide, volcanic activity, fire, flood or inundation, tidal wave, typhoon or cyclone, hurricane, storm, lightning, or other inclement weather condition, nuclear and pressure waves or other natural or physical disaster

f) shortage of labour, materials or utilities where caused by circumstances that are themselves Force Majeure.

37.2 If either Party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within fourteen (14) days after the occurrence of such event.

37.3 The Party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such Party's performance is prevented, hindered or delayed. The Time for Completion shall be extended in accordance with GCC Clause 40.

37.4 The Party or Parties affected by the event of Force Majeure shall use reasonable efforts to mitigate the effect thereof upon its or their performance of the Contract and to fulfil its or their obligations under the Contract, but without prejudice to either Party's right to terminate the Contract under GCC Sub-Clauses 37.6 and 38.5.

37.5 No delay or non-performance by either Party hereto caused by the occurrence of any event of Force Majeure shall

a) constitute a default or breach of the Contract, or

b) give rise to any claim for damages or additional cost or expense occasioned thereby, subject to GCC Sub-Clauses 32.2, 38.3 and 38.4

if and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure.

37.6 If the performance of the Contract is substantially prevented, hindered or delayed for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of one or more events of Force Majeure during the currency of the Contract, the Parties will attempt to develop a mutually satisfactory solution, failing which either Party may terminate the Contract by giving a notice to the other, but without prejudice to either Party's right to terminate the Contract under GCC Sub-Clause 38.5.

37.7 In the event of termination pursuant to GCC Sub-Clause 37.6, the rights and obligations of the Procuring Entity and the Contractor shall be as specified in GCC Sub-Clauses 42.1.2 and 42.1.3.

37.8 Notwithstanding GCC Sub-Clause 37.5, Force Majeure shall not apply to any obligation of the Procuring Entity to make payments to the Contractor herein.

38. War Risks

38.1 "War Risks" shall mean any event specified in paragraphs (a) and (b) of GCC Sub-Clause 37.1 and any explosion or impact of any mine, bomb, shell, grenade or other projectile, missile, munitions or explosive of war, occurring or existing in or near the country (or countries) where the Site is located.

38.2 Notwithstanding anything contained in the Contract, the Contractor shall have no liability whatsoever for or with respect to

a) destruction of or damage to Facilities, Plant, or any part thereof;

b) destruction of or damage to property of the Procuring Entity or any third Party; or

c) injury or loss of life

if such destruction, damage, injury or loss of life is caused by any War Risks, and the Procuring Entity shall indemnify and hold the Contractor harmless from and against any and all claims, liabilities, actions, lawsuits, damages, costs, charges or expenses arising in consequence of or in connection with the same.

38.3 If the Facilities or any Plant or Contractor's Equipment or any other property of the Contractor used or intended to be used for the purposes of the Facilities shall sustain destruction or damage by reason of any War Risks, the Procuring Entity shall pay the Contractor for

a) any part of the Facilities or the Plant so destroyed or damaged to the extent not already paid for by the Procuring Entity and so far as may be required by the Procuring Entity, and as may be necessary for completion of the Facilities

b) replacing or making good any Contractor's Equipment or other property of the Contractor so destroyed or damaged

c) replacing or making good any such destruction or damage to the Facilities or the Plant or any part thereof.

If the Procuring Entity does not require the Contractor to replace or make good any such destruction or damage to the Facilities, the Procuring Entity shall either request a change in accordance with GCC Clause 39, excluding the performance of that part of the Facilities thereby destroyed or damaged or, where the loss, destruction or damage affects a substantial part of the Facilities, shall terminate the Contract, pursuant to GCC Sub-Clause 42.1.

If the Procuring Entity requires the Contractor to replace or make good on any such destruction or damage to the Facilities, the Time for Completion shall be extended in accordance with GCC 40.

38.4 Notwithstanding anything contained in the Contract, the Procuring Entity shall pay the Contractor for any increased costs or incidentals to the execution of the Contract that are in any way attributable to, consequent on, resulting from, or in any way connected with any War Risks, provided that the Contractor shall as soon as practicable notify the Procuring Entity in writing of any such increased cost.

38.5 If during the performance of the Contract any War Risks shall occur that financially or otherwise materially affect the execution of the Contract by the Contractor, the Contractor shall use

its reasonable efforts to execute the Contract with due and proper consideration given to the safety of its and its Subcontractors' personnel engaged in the work on the Facilities, provided, however, that if the execution of the work on the Facilities becomes impossible or is substantially prevented for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of any War Risks, the Parties will attempt to develop a mutually satisfactory solution, failing which either Party may terminate the Contract by giving a notice to the other.

38.6 In the event of termination pursuant to GCC Sub-Clauses 38.3 or 38.5, the rights and obligations of the Procuring Entity and the Contractor shall be specified in GCC Sub-Clauses 42.1.2 and 42.1.3. A. Change in Contract Elements.

33. **Change in Contract Elements**

39. Change in the Facilities

39.1 Introducing a Change

39.1.1 Subject to GCC Sub-Clauses 39.2.5 and 39.2.7, the Procuring Entity shall have the right to propose, and subsequently require, that the Project Manager order the Contractor from time to time during the performance of the Contract to make any change, modification, addition or deletion to, in or from the Facilities here in after called "Change", provided that such Change falls within the general scope of the Facilities and does not constitute unrelated work and that it is technically practicable, taking into account both the state of advancement of the Facilities and the technical compatibility of the Change envisaged with the nature of the Facilities as specified in the Contract.

39.1.2 Value Engineering: The Contractor may prepare, at its own cost, a value engineering proposal at any time during the performance of the contract. The value engineering proposal shall, at a minimum, include the following;

a) The proposed change (s), and a description of the difference to the existing contract requirements;

b) a full cost/benefit analysis of the proposed change(s) including a description and estimate of costs (including life cycle costs) the Procuring Entity may incur in implementing the value engineering proposal; and

c) a description of any effect (s) of the change on performance/ functionality.

The Procuring Entity may accept the value engineering proposal if the proposal demonstrates benefits that:

a) accelerates the delivery period; or

b) reduces the Contract Price or the life cycle costs to the Procuring Entity; or

c) improves the quality, efficiency, safety or sustain ability of the Facilities; or

d) yields any other benefits to the Procuring Entity, without compromising the necessary functions of the Facilities.

If the value engineering proposal is approved by the Procuring Entity and results in:

(a) a reduction of the Contract Price; the amount to be paid to the Contractor shall be the percentage specified in the **SCC** of the reduction in the Contract Price; or

(b) an increase in the Contract Price; but results in a reduction in life cycle costs due to any benefit described in (a) to (d) above, the amount to be paid to the Contractor shall be the full increase in the Contract Price.

39.1.3 Notwithstanding GCC Sub-Clauses 39.1.1 and 39.1.2, no change made necessary because of any default of the Contractor in the performance of its obligations under the Contract shall be deemed to be a Change, and such change shall not result in any adjustment of the Contract Price or the Time for Completion.

39.1.4 The procedure on how to proceed with and execute Changes is specified in GCC Sub-Clauses 39.2 and 39.3, and further details and forms are provided in the Procuring Entity's Requirements (Forms and Procedures).

39.2 Changes Originating from Procuring Entity

39.2.1 If the Procuring Entity proposes a Change pursuant to GCC Sub-Clause 39.1.1, it shall send to the Contractor a "Request for Change Proposal," requiring the Contractor to prepare and furnish to the Project Manager as soon as reasonably practicable a "Change Proposal," which shall include the following:

a) Brief description of the Change

b) Effect on the Time for Completion

c) Estimated cost of the Change

d) Effect on Functional Guarantees (if any)

e) Effect on the Facilities

f) Effect on any other provisions of the Contract.

39.2.2 Prior to preparing and submitting the "Change Proposal," the Contractor shall submit to the Project Manager an "Estimate for Change Proposal," which shall be an estimate of the cost of preparing and submitting the Change Proposal.
Upon receipt of the Contractor's Estimate for Change Proposal, the Procuring Entity shall do one of the following:

- Accept the Contractor's estimate with instructions to the Contractor to proceed with the preparation of the Change Proposal
- Advise the Contractor of any part of its Estimate for Change Proposal that is unacceptable and request the Contractor to review its estimate
- Advise the Contractor that the Procuring Entity does not intend to proceed with the Change.

39.2.3 Upon receipt of the Procuring Entity's instruction to proceed under GCC Sub-Clause 39.2.2 (a), the Contractor shall, with proper expedition, proceed with the preparation of the Change Proposal, in accordance with GCC Sub-Clause 39.2.1.

39.2.4 The pricing of any Change shall, as far as practicable, be calculated in accordance with the rates and prices included in the Contract. If such rates and prices are inequitable, the Parties there to shall agree on specific rates for the valuation of the Change.

39.1.5 If before or during the preparation of the Change Proposal it becomes apparent that the aggregate effect of compliance there with and with all other Change Orders that have already become binding upon the Contractor under this GCC Clause 39 would be to increase or decrease the Contract Price as originally set for thin Article 2 (Contract Price) of the Contract Agreement by more than fifteen percent (15%), the Contractor may give a written notice of objection there to prior to furnishing the Change Proposal as aforesaid. If the Procuring Entity accepts the Contractor's objection, the Procuring Entity shall withdraw the proposed Change and shall notify the Contractor in writing thereof.

The Contractor's failure to so object shall neither affect its right to object to any subsequent requested Changes or Change Orders here in, nor affect its right to take in to account, when making such subsequent objection, the percentage increase or decrease in the Contract Price that any Change not objected to by the Contractor represents.

39.1.6 Upon receipt of the Change Proposal, the Procuring Entity and the Contractor shall mutually agree upon all matters therein contained. Within fourteen (14) days after such agreement, the Procuring Entity shall, if it intends to proceed with the Change, issue the Contractor with a Change Order.

If the Procuring Entity is unable to reach a decision within fourteen (14) days, it shall notify the Contractor with details of when the Contractor can expect a decision.

If the Procuring Entity decides not to proceed with the Change for whatever reason, it shall, within the said period of fourteen (14) days, notify the Contractor accordingly. Under such circumstances, the Contractor shall be entitled to reimbursement of all costs reasonably incurred by it in the preparation of the Change Proposal, provided that these do not exceed the amount given by the Contractor in its Estimate for Change Proposal submitted in accordance with GCC Sub-Clause 39.2.2.

39.1.7 If the Procuring Entity and the Contractor cannot reach agreement on the price for the Change, an equitable adjustment to the Time for Completion, or any other matters identified in the Change Proposal, the Procuring Entity may nevertheless instruct the Contractor to proceed with the Change by issue of a “Pending Agreement Change Order.”

Upon receipt of a Pending Agreement Change Order, the Contractor shall immediately proceed with effecting the Changes covered by such Order. The Parties shall there after attempt to reach agreement on the outstanding issues under the Change Proposal.

If the Parties cannot reach agreement within sixty (60) days from the date of issue of the Pending Agreement Change Order, then the matter may be referred to the Dispute Board in accordance with the provisions of GCC Sub-Clause 46.1.

39.1.8 Changes Originating from Contractor

39.1.9 If the Contractor proposes a Change pursuant to GCC Sub-Clause 39.1.2, the Contractor shall submit to the Project Manager a written “Application for Change Proposal,” giving reasons for the proposed Change and including the information specified in GCC Sub-Clause 39.1.2.

39.1.10 Upon receipt of the Application for Change Proposal, the Parties shall follow the procedures outlined in GCC Sub-Clauses 39.2.6 and 39.2.7. However, the Contractor shall not be entitled to

recover the costs of preparing the Application for Change Proposal.

40. Extension of Time for Completion

40.1 The Time(s) for Completion specified in the **SCC** pursuant to GCC Sub-Clause 8.2 shall be extended if the Contractor is delayed or impeded in the performance of any of its obligations under the Contract by reason of any of the following:

a) any Change in the Facilities as provided in GCC Clause 39

b) any occurrence of Force Majeure as provided in GCC Clause 37, unforeseen conditions as provided in GCC Clause 35, or other occurrence of any of the matters specified or referred to in paragraphs (a), (b) and (c) of GCC Sub-Clause 32.2

c) Any suspension order given by the Procuring Entity under GCC Clause 41 here of or reduction in the rate of progress pursuant to GCC Sub-Clause 41.2 or

- Any changes in laws and regulations as provided in GCC Clause 36 or
- Any default or breach of the Contract by the Procuring Entity, Appendix to the Contract Agreement titled, or any activity, actor omission of the Procuring Entity, or the Project Manager, or any other contractors employed by the Procuring Entity, or
- Any delay on the part of a Subcontractor, provided such delay is due to a cause for which the Contractor himself would have been entitled to an extension of time under this sub-clause, or
- Delays attributable to the Procuring Entity or caused by customs, or

h) any other matter specifically mentioned in the Contract by such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the Contractor.

40.2 Except where otherwise specifically provided in the Contract, the Contractor shall submit to the Project Manager a notice of a claim for an extension of the Time for Completion, together with particulars of the event or circumstance justifying such extension as soon as reasonably practicable after the commencement of such event or circumstance. As soon as reasonably practicable after receipt of such notice and supporting particulars of the claim, the Procuring Entity and the Contractor shall agree upon the period of such extension. In the event that the Contractor does not accept the Procuring Entity's estimate of a fair and reasonable time extension, the Contractor shall be entitled to refer the matter to a Dispute Board, pursuant to GCC Sub-Clause 46.1.

40.3 The Contractor shall at all times use its reasonable efforts to minimize any delay in the performance of its obligations under the Contract.

40.4 In all cases where the Contractor has given a notice of a claim for an extension of time under GCC 40.2, the Contractor shall consult with the Project Manager in order to determine the steps (if any) which can be taken to overcome or minimize the actual or anticipated delay. The Contractor shall there after comply with all reasonable instructions which the Project Manager shall give in order to minimize such delay. If compliance with such instructions shall cause the Contractor to incur extra costs and the Contractor is entitled to an extension of time under GCC 40.1, the amount of such extra costs shall be added to the Contract Price.

41 Suspension

41.1 Procuring Entity may request the Project Manager, by notice to the Contractor, to order the Contractor to suspend performance of any or all of its obligations under the Contract. Such notice shall specify the obligation of which performance is to be suspended, the effective date of the

suspension and the reasons therefor. The Contractor shall thereupon suspend performance of such obligation, except those obligations necessary for the care or preservation of the Facilities, until ordered in writing to resume such performance by the Project Manager.

If, by virtue of a suspension order given by the Project Manager, other than by reason of the Contractor's default or breach of the Contract, the Contractor's performance of any of its obligations is suspended for an aggregate period of more than ninety (90) days, then at any time there after and provided that at that time such performance is still suspended, the Contractor may give a notice to the Project Manager requiring that the Procuring Entity shall, within twenty-eight (28) days of receipt of the notice, order the resumption of such performance or request and subsequently order a change in accordance with GCC Clause 39, excluding the performance of the suspended obligations from the Contract.

41.2 If the Procuring Entity fails to do so within such period, the Contractor may, by a further notice to the Project Manager, elect to treat the suspension, where it affects apart only of the Facilities, as a deletion of such part in accordance with GCC Clause 39 or, where it affects the whole of the Facilities, as termination of the Contract under GCC Sub-Clause.

41.3 If

a. Procuring Entity has failed to pay the Contractor any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to the Appendix to the Contract Agreement titled Terms and Procedures of Payment, or commits a substantial breach of the Contract, the Contractor may give a notice to the Procuring Entity that requires payment of such sum, with interest there on as stipulated in GCC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Procuring Entity to remedy the same, as the case may be. If the Procuring Entity fails to pay such sum together with such interest, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, or fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Contractor's notice or

b. The Contractor is unable to carry out any of its obligations under the Contract for any reason attributable to the Procuring Entity, including but not limited to the Procuring Entity's failure to provide possession of or access to the Site or other areas in accordance with GCC Sub-Clause 10.2, or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities, then the Contractor may by fourteen (14) days' notice to the Procuring Entity suspend performance of all or any of its obligations under the Contract, or reduce the rate of progress.

41.3 If the Contractor's performance of its obligations is suspended or the rate of progress is reduced pursuant to this GCC Clause 41, then the Time for Completion shall be extended in accordance with GCC Sub-Clause 40.1, and any and all additional costs or expenses incurred by the Contractor as a result of such suspension or reduction shall be paid by the Procuring Entity to the Contractor in addition to the Contract Price, except in the case of suspension order or reduction in the rate of progress by reason of the Contractor's default or breach of the Contract.

41.4 During the period of suspension, the Contractor shall not remove from the Site any Plant, any part of the Facilities or any Contractor's Equipment, without the prior written consent of the Procuring Entity.

42 Termination

42.1 Termination for Procuring Entity's Convenience

42.1.1 The Procuring Entity may at any time terminate the Contract for any reason by giving the Contractor a notice of termination that refers to this GCC Sub-Clause 42.1.

42.1.2 Upon receipt of the notice of termination under GCC Sub-Clause 42.1.1, the Contractor shall either immediately or upon the date specified in the notice of termination

a) cease all further work, except for such work as the Procuring Entity may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition,

b) terminate all subcontracts, except those to be assigned to the Procuring Entity pursuant to paragraph (d) (ii) below,

c) remove all Contractor's Equipment from the Site, repatriate the Contractor's and its Subcontractors' personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition, and

d) subject to the payment specified in GCC Sub-Clause 42.1.3,

i. deliver to the Procuring Entity the parts of the Facilities executed by the Contractor up to the date of termination

ii. to the extent legally possible, assign to the Procuring Entity all right, title and benefit of the Contractor to the Facilities and to the Plant as of the date of termination, and, as may be required by the Procuring Entity, in any subcontracts concluded between the Contractor and its Subcontractors; and

iii. deliver to the Procuring Entity all non-proprietary drawings, specifications and other documents prepared by the Contractor or its Subcontractors as at the date of termination in connection with the Facilities.

42.1.3 In the event of termination of the Contract under GCC Sub-Clause 42.1.1, the Procuring Entity shall pay to the Contractor the following amounts:

a The Contract Price, properly attributable to the parts of the Facilities executed by the Contractor as of the date of termination,

b the costs reasonably incurred by the Contractor in the removal of the Contractor's Equipment from the Site and in the repatriation of the Contractor's and its Subcontractors' personnel,

c any amounts to be paid by the Contractor to its Subcontractors in connection with the termination of any subcontracts, including any cancellation charges,

d costs incurred by the Contractor in protecting the Facilities and leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 42.1.2

e the cost of satisfying all other obligations, commitments and claims that the Contractor may in good faith have under taken with third Parties in connection with the Contract and that are not covered by paragraphs (a) through (d) above.

42.2 Termination by the Contractor

42

42.2

42.2.1 The Procuring Entity, without prejudice to any other rights or remedies it may possess, may terminate the Contract forth within the following circumstances by giving a notice of termination and its reasons there for to the Contractor, referring to this GCC Sub-Clause 42.2:

a If the Contractor becomes bankrupt or in solvent, has a receiving order issued against it,

compounds with its creditors, or, if the Contractor is a corporation, are solution is passed or order is made for its winding up, other than a voluntary liquidation for the purposes of amalgamation or reconstruction, a receiver is appointed over any part of its undertaking or assets, or if the Contractor takes or suffers any other analogous action in consequence of debt

b if the Contractor assigns or transfers the Contract or any right or interest therein in violation of the provision of GCC Clause 43.

c If the Contractor, in the judgment of the Procuring Entity has engaged in Fraud and Corruption, as defined in paragraph 2.2a. of Appendix B to the GCC, in competing for or in executing the Contract.

42.2.2 If the Contractor

a Has abandoned or repudiated the Contract

b Has without valid reason failed to commence work on the Facilities promptly or has suspended, other than pursuant to GCC Sub-Clause 41.2, the progress of Contract performance for more than twenty-eight (28) days after receiving a written instruction from the Procuring Entity to proceed

c Persistently fails to execute the Contract in accordance with the Contractor persistently neglects to carry out its obligations under the Contract without just cause

d Refuses or is unable to provide sufficient materials, services or labor to execute and complete the Facilities in the manner specified in the program furnished under GCC Sub-Clause 18.2 at rates of progress that give reasonable assurance to the Procuring Entity that the Contractor can attain Completion of the Facilities by the Time for Completion as extended, then the Procuring Entity may, without prejudice to any other rights it may possess under the Contract, give a notice to the Contractor stating the nature of the default and requiring the Contractor to remedy the same. If the Contractor fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the Procuring Entity may terminate the Contract forth with by giving a notice of termination to the Contractor that refers to this GCC Sub-Clause 42.2.

42.2.3 Upon receipt of the notice of termination under GCC Sub-Clauses 42.2.1 or 42.2.2, the Contractor shall, either immediately or upon such date as is specified in the notice of termination,

a cease all further work, except for such work as the Procuring Entity may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition.

b Terminate all subcontracts, except those to be assigned to the Procuring Entity pursuant to paragraph (d) below,

c deliver to the Procuring Entity the parts of the Facilities executed by the Contractor up to the date of termination,

d to the extent legally possible, assign to the Procuring Entity all right, title and benefit of the Contractor to the Facilities and to the Plant as of the date of termination, and, as may be required by the Procuring Entity, in any subcontracts concluded between the Contractor and its Subcontractors,

e deliver to the Procuring Entity all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as of the date of termination in connection with the Facilities.

42.2.4 The Procuring Entity may enter upon the Site, expel the Contractor, and complete the Facilities itself or by employing any third Party. The Procuring Entity may, to the exclusion of any right of the Contractor over the same, take over and use with the payment of a fair rental rate to the Contractor,

with all the maintenance costs to the account of the Procuring Entity and with an indemnification by the Procuring Entity for all liability including damage or injury to persons arising out of the Procuring Entity's use of such equipment, any Contractor's Equipment owned by the Contractor and on the Site in connection with the Facilities for such reasonable period as the Procuring Entity considers expedient for the supply and installation of the Facilities.

42.2.5 Upon completion of the Facilities or at such earlier date as the Procuring Entity thinks appropriate, the Procuring Entity shall give notice to the Contractor that such Contractor's Equipment will be returned to the Contractor at or near the Site and shall return such Contractor's Equipment to the Contractor in accordance with such notice. The Contractor shall thereafter without delay and at its cost remove or arrange removal of the same from the Site.

42.2.6 Subject to GCC Sub-Clause 42.2.6, the Contractor shall be entitled to be paid the Contract Price attributable to the Facilities executed as of the date of termination, the value of any unused or partially used Plant on the Site, and the costs, if any, incurred in protecting the Facilities and in leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 42.2.3. Any sums due the Procuring Entity from the Contractor accruing prior to the date of termination shall be deducted from the amount to be paid to the Contractor under this Contract.

42.2.7 If the Procuring Entity completes the Facilities, the cost of completing the Facilities by the Procuring Entity shall be determined.

42.2.8 If the sum that the Contractor is entitled to be paid, pursuant to GCC Sub-Clause 42.2.5, plus the reasonable costs incurred by the Procuring Entity in completing the Facilities, exceeds the Contract Price, the Contractor shall be liable for such excess.

42.2.9 If such excess is greater than the sums due the Contractor under GCC Sub-Clause 42.2.5, the Contractor shall pay the balance to the Procuring Entity, and if such excess is less than the sums due the Contractor under GCC Sub-Clause 42.2.5, the Procuring Entity shall pay the balance to the Contractor. The Procuring Entity and the Contractor shall agree, in writing, on the computation described above and the manner in which any sums shall be paid.

42.3 Termination by the Contractor

42.3.1 If

a The Procuring Entity has failed to pay the Contractor any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to the Appendix to the Contract Agreement titled Terms and Procedures of Payment, or commits a substantial breach of the Contract, the Contractor may give a notice to the Procuring Entity that requires payment of such sum, with interest there on as stipulated in GCC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Procuring Entity to remedy the same, as the case may be. If the Procuring Entity fails to pay such sum together with such interest, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Contractor's notice, or

b The Contractor is unable to carry out any of its obligations under the Contract for any reason attributable to the Procuring Entity, including but not limited to the Procuring Entity's failure to provide possession of or access to the Site or other areas or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities, then the Contractor may give a notice to the Procuring Entity thereof, and if the Procuring Entity has failed to pay the outstanding sum, to approve the invoice or supporting documents, to give its reasons for withholding such approval, or to

remedy the breach within twenty-eight (28) days of such notice, or if the Contractor is still unable to carry out any of its obligations under the Contract for any reason attributable to the Procuring Entity within twenty-eight (28) days of the said notice, the Contractor may by a further notice to the Procuring Entity referring to this GCC Sub-Clause 42.3.1, forth with terminate the Contract.

42.3.2 The Contractor may terminate the Contract forth with by giving a notice to the Procuring Entity to that effect, referring to this GCC Sub-Clause 42.3.2, if the Procuring Entity becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, being a corporation, if are solution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Procuring Entity takes or suffers any other analogous action in consequence of debt.

42.3.3 If the Contract is terminated under GCC Sub-Clauses 42.3.1 or 42.3.2, then the Contractor shall immediately

a) cease all further work, except for such work as may be necessary for the purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition

b) terminate all subcontracts, except those to be assigned to the Procuring Entity pursuant to paragraph (d) (ii)

c) remove all Contractor's Equipment from the Site and repatriate the Contractor's and its Subcontractors' personnel from the Site, and

d) subject to the payment specified in GCC Sub-Clause 42.3.4,

i) deliver to the Procuring Entity the parts of the Facilities executed by the Contractor up to the date of termination

ii) to the extent legally possible, assign to the Procuring Entity all right, title and benefit of the Contractor to the Facilities and to the Plant as of the date of termination, and, as may be required by the Procuring Entity, in any subcontracts concluded between the Contractor and its Subcontractors, and

iii) deliver to the Procuring Entity all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as of the date of termination in connection with the Facilities.

42.3.4 If the Contract is terminated under GCC Sub-Clauses 42.3.1 or 42.3.2, the Procuring Entity shall pay to the Contractor all payments specified in GCC Sub-Clause 42.1.3, and reasonable compensation for all loss, except for loss of profit, or damage sustained by the Contractor arising out of, in connection with or in consequence of such termination.

42.3.5 Termination by the Contractor pursuant to this GCC Sub-Clause 42.3 is without prejudice to any other rights or remedies of the Contractor that may be exercised in lieu of or in addition to rights conferred by GCC Sub-Clause 42.3.

42.4 In this GCC Clause 42, the expression “Facilities executed” shall include all work executed, Installation Services provided, and all Plant acquired, or subject to a legally binding obligation to purchase, by the Contractor and used or intended to be used for the purpose of the Facilities, up to and including the date of termination.

42.5 In this GCC Clause 42, in calculating any monies due from the Procuring Entity to the Contractor, account shall be taken of any sum previously paid by the Procuring Entity to the Contractor

under the Contract, including any advance payment paid pursuant to the Appendix to the Contract Agreement titled Terms and Procedures of Payment.

43. Assignment

43.1 Neither the Procuring Entity nor the Contractor shall, without the express prior written consent of the other Party, which consent shall not be unreasonably withheld, assign to any third Party the Contract or any part thereof, or any right, benefit, obligation or interest therein or thereunder, except that the Contractor shall be entitled to assign either absolutely or by way of charge any monies due and payable to it or that may become due and payable to it under the Contract.

44. Export Restrictions

44.1 Notwithstanding any obligation under the Contract to complete all export formalities, any export restrictions attributable to the Procuring Entity, to Kenya or to the use of the Plant and Installation Services to be supplied which arise from trade regulations from a country supplying those Plant and Installation Services, and which substantially impede the Contractor from meeting its obligations under the Contract, shall release the Contractor from the obligation to provide deliveries or services, always provided, however, that the Contractor can demonstrate to the satisfaction of the Procuring Entity and of the Bank that it has completed all formalities in a timely manner, including applying for permits, authorizations and licenses necessary for the export of the Plant and Installation Services under the terms of the Contract. Termination of the Contract on this basis shall be for the Procuring Entity's convenience pursuant to Sub-Clause 42.1.

B. Claims, Disputes and Arbitration

45. Contractor's Claims

45.1 If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall submit a notice to the Project Manager, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware, or should have become aware, of the event or circumstance.

45.2 If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Procuring Entity shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

(a) The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

(b) The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Project Manager. Without admitting the Procuring Entity's liability, the Project Manager may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Project Manager to inspect all these records, and shall (if instructed) submit copies to the Project Manager.

45.3 Within 42 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Project Manager, the Contractor shall send to the Project Manager a fully detailed claim which includes full supporting particulars of the basis of the claim and of the

extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

a) this fully detailed claim shall be considered as interim;

b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Project Manager may reasonably require; and

c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Project Manager.

45.4 Within 42 days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Project Manager and approved by the Contractor, the Project Manager shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within such time.

45.5 Each Payment Certificate shall include such amounts for any claim as have been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

45.6 The Project Manager shall agree with the Contractor or estimate: (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with GCC Clause 40, and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

45.7 The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

45.8 In the event that the Contractor and the Procuring Entity cannot agree on any matter relating to a claim, either Party may refer the matter to the Dispute Board pursuant to GCC 46 hereof.

46. Claims, Disputes and Arbitration

46.1 Contractor's Claims

46.1.1 If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Project Manager, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware, or should have become aware, of the event or circumstance.

46.1.2 If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Procuring Entity shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply. The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

46.1.3 The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Project Manager. Without admitting the Procuring Entity's liability, the Project Manager may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Project Manager to inspect all these records, and shall (if instructed) submit copies to the Project Manager.

46.1.4 Within 42 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Project Manager, the Contractor shall send to the Project Manager a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

a) this fully detailed claim shall be considered as interim;

b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Project Manager may reasonably require; and

c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Project Manager.

46.1.5 Within 42 days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Project Manager and approved by the Contractor, the Project Manager shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within the above defined time period.

46.1.6 Within the above defined period of 42 days, the Project Manager shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.4 [Extension of Time for Completion], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

46.1.7 Each Payment Certificate shall include such additional payment for any claim as has been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

46.1.8 If the Project Manager does not respond within the timeframe defined in this Clause, either Party may consider that the claim is rejected by the Project Manager and any of the Parties may refer the matter to Arbitration in accordance with Sub-Clause 46.4.

46.1.9 The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

46.2 Issuing a Notice of Dissatisfaction

If a dispute (of any kind whatsoever) arises between the Parties in connection with, or arising out of,

the Contract or the execution of the Works, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Project Manager, either Party may refer the dispute in writing to the Project Manager by issuing a Notice of Dissatisfaction and requesting the matter be referred to Arbitration.

46.3 Amicable Settlement

Where a Notice of Dissatisfaction has been given, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, the Party giving a Notice of Dissatisfaction should move to commence arbitration after the fifty-sixth day from the day on which a Notice of Dissatisfaction was given, even if no attempt at an amicable settlement has been made.

46.4 Arbitration

46.4.1 Any dispute between the Parties arising out of or in connection with the Contract not settled amicably in accordance with Sub-Clause 46.3 above shall be finally settled by arbitration. Arbitration shall be conducted as follows:

a) if the contract is with foreign contractors, the dispute shall be referred to international arbitration either:

i) with proceedings administered by the arbitration institution designated in the Special Conditions of Contract, and conducted under the rules of arbitration of such institution; or, if so specified in the Special Conditions of Contract, or

ii) international arbitration in accordance with the arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL), unless specified otherwise in the **SCC**;

b) if the Contract is with domestic contractors, arbitration with proceedings conducted in accordance with the Arbitration Laws of Kenya.

46.4.2 The place of arbitration shall be the neutral location specified in the Special Conditions of Contract; and the arbitration shall be conducted in the English Language for all communications.

46.4.3 The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Project Manager. Nothing shall disqualify representatives of the Parties and the Project Manager from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.

46.4.4 Neither Party shall be limited in the proceedings before the arbitrators to the evidence to obtain its decision, or to the reasons for dissatisfaction given in its Notice of Dissatisfaction.

46.4.5 Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties and the Project Manager shall not be altered by reason of any arbitration being conducted during the progress of the Works.

46.4.6 The Decision of the Arbitration proceedings will be final and binding on both parties

SECTION IX - SPECIAL CONDITIONS OF CONTRACT

The following Special Conditions of Contract shall supplement the General Conditions of Contract in Section VIII. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions.

Special Conditions of Contract (SCC)

The following Special Conditions (SCC) shall supplement the General Conditions (GCC). Whenever there is a conflict, the provisions here in shall prevail over those in the GCC. The clause number of the SCC is the corresponding clause number of the GCC.

Number of GC Clause	**Amendments of, and Supplements to, Clauses in the General Conditions of Contract**
SCC 1. Definitions	**The Procuring Entity is**: NAME: KENYA AIRPORTS AUTHORITY, ADDRESS: P.O. Box 19001-00501 Nairobi, Kenya AUTHORISED REPRESENTATIVE: General Manager, Procurement & Logistics_____ **The Project Manager is**: General Manager, Projects and Engineering Services, Kenya Airports Authority P.O. Box 19001-00501 Nairobi, Kenya _____ Country of Origin: all countries and territories as indicated in Section V of the Tendering document, Eligible Countries.
SCC 2.1 Contract Document	1. The Contract Agreement, 2. Bid Document 3. The Form of Tender, 4. The Special Conditions of Contract, 5. The General Conditions of Contract 6. The Technical Specifications

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
	7. The General Specifications (insert as applicable) 8. The Drawings 9. The Bills of Quantities and Schedule of rates 10. The Tender document and 11. Any other documents forming part of the Contract
SCC 4 Communication	Delete 4.3 and replace 4.1
SCC 5. Law and Language	SCC 5.1 The Contract shall be governed by in accordance with Laws of Kenya SCC5.2 The ruling language of the Contract shall be English Language. SCC5.3 The language for communications shall be the English language
SCC 7. Scope of Facilities [Spare Parts] (GCC Clause 7)	SCC 7.3 The Contractor agrees to supply spare parts for a period of years: *During the warranty period _of 12 Months __* _____
SCC 8. Time for Commencement and Completion	SCC 8.1 The Contractor shall commence work on the Facilities within 14 days from the Effective Date for determining Time for Completion as specified in the Contract Agreement. The Commencement Date shall be 14days after the Project Manager has issued Notice of Commencement. This shall be issued after the following precedent conditions have all been fulfilled: a) Submission of Performance Guarantee in accordance with Clause 4.2 of the GCC b) Signing of the Contract Agreement by both Parties. c) Submission of revised program of works in the form and detail provided for under Clause 8.3 of GCC d) Access to the Site as provided in Clause 2.1 of the SCC. e) Submission of Insurance Policies f) Issuance of NOTAM (Where applicable)

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
	SCC 8.2 The Time for Completion of the whole of the Facilities shall be _____ from the Effective Date as described in the Contract Agreement. *Copy doc 2*
SCC 9. Contractor's Responsibilities	9.2.- 'other data readily available to it relating to the Facilities prior to Tender submission' 9.7 – delete "9.7 Pursuant to paragraph 2.2 e. of Appendix B to the General Conditions" 9.8 -The following sustainable procurement contractual provisions apply: procurement of environmentally friendly equipment as per ISO 14001 _____
SCC 10.5 Procuring Entity's Responsibilities	The Contractor, shall supply and make available all raw materials, utilities, lubricants, chemicals, catalysts, other materials and facilities; and shall perform all work and services of whatsoever nature, including those required to properly carry out Pre-commissioning, Commissioning and Guarantee Tests, all in accordance with the provisions of the Appendix to the Contract Agreement titled Scope of Works and Supply by the Procuring Entity.
SCC 11. Contract Price	11.2 The Contract Price shall be Not adjusted.
SCC 12 Terms of payment	12.3 Interest rate on delayed payments allowed 3% above Central Bank of Kenya lending rate it should not exceed the principal amount of the particular IPC
SCC 13. Securities	SCC 13.2 Advance Payment Security; The Advance Payment Guarantee shall be issued by a bank located in Kenya, licensed by the Central Bank of Kenya and acceptable to the Procuring Entity and in the form provided in Section III- Advance Payment Guarantee SCC 13.3.1 The amount of Performance Security, as a percentage of the Contract Price for the Facility or for the part of the Facility for which a separate Time for Completion is provided, shall be: ____*10%*_____ SCC 13.3.2 The Performance Security shall be in the form of the bank Guarantee from a reputable bank _____attached hereto in Section X, Contract Forms. SCC 13.3.3 The Performance Security shall not be reduced on the date of the Operational Acceptance. SCC 13.3.3 The Performance Security shall not be reduced but shall remain valid up to the end of the defect liability period

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
SCC 17 representatives	SCC 17.1 project manager …….: General Manager, Projects and Engineering Services, Kenya Airports Authority P.O. Box 19001-00501 Nairobi, Kenya SCC 17.2 contractor's representative …. (*to be provided by the contractor*)
SCC 18 Work Program	SCC 18.5 procedure Amend to read The Contract shall be executed in accordance with the Contract Documents including the procedures given in the Forms and Procedures of the Procuring Entity's Requirements. The Contractor may execute the Contract in accordance with its own standard project execution plans and procedures to the extent that they do not conflict with the provisions contained in the Contract.
SCC 22 Installation	SCC22.2.5 Working Hours Normal working hours are: *Morning: 0800hrs to 1300hrs* *Afternoon: 1400hrs to 1700hrs* *Monday to Friday except on holidays*_____ SCC 22.2.8 Funeral Arrangements: contractor is responsible for own staff arrangement
SCC 25. Commissioning and Operational Acceptance	Replace SCC 25.1.1. under GCC 25.2 to read SCC 25.2.1 SCC 25.2.1 The Guarantee Test of the Facilities shall be successfully completed within ___21 days___ from the date of Completion.
SCC 26. Completion Time Guarantee	SCC 26.2 Applicable rate for liquidated damages: __*0.1%_of contract amount per day* _____

Number of GC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
	The above rate applies to the price of the part of the Facilities, as quoted in the Price Schedule, for that part for which the Contractor fails to achieve Completion within the particular Time for Completion. Maximum deduction for liquidated damages: *_10%__of contract amount* _____ SCC 26.3 Applicable *NONE* for the bonus for early Completion: Maximum bonus: SCC 26.3 No bonus will be given for earlier Completion of the Facilities or part thereof.
SCC 27. Defect Liability	SCC 27.2 The Defect Liability Period shall be five hundred and forty (540) days from the date of Completion of the Facilities or one year from the date of Operational Acceptance of the Facilities
SCC 30. Limitation of Liability	SCC 30.1 (b) The multiplier of the Contract Price is: ___*None*_____
SCC 39. Value Engineering	SCC 39.1.2 If the value engineering proposal is approved by the Procuring Entity the amount to be paid to the Contractor shall be _10__% of the reduction in the Contract Price
SCC 42 Termination	SCC *42.2 should read "Termination by the Procuring Entity*
SCC 46.4(a)(ii) Arbitration	*[Insert rules of arbitration if different from those of the International Chamber of Commerce]* Arbitrator shall be appointed by the registrar of Nairobi Centre for International Arbitration The place of arbitration shall be in Nairobi

SECTION VIII - CONTRACT FORMS

Notification of Award - Form of Acceptance

Contract Agreement

Appendix 1. Terms and Procedures of Payment

Appendix 2. Price Adjustment

Appendix 3. Insurance Requirements

Appendix 4. Time Schedule

Appendix 5. List of Major Items of Plant and Installation Services and List of Approved Subcontractors

Appendix 6. Scope of Works and Supply by the Procuring Entity

Appendix 7. List of Documents for Approval or Review

Appendix 8. Functional Guarantees

Performance Security Form

OPTION 1 – Demand Bank Guarantee Performance Security Form

OPTION 2 – Performance Bond Advance Payment Security- Demand Bank Guarantee

Beneficial Ownership Disclosure

NOTIFICATION OF INTENTION TO AWARD

[This Notification of Intention to Award shall be sent to each Tenderer that submitted a Tender.] [Send this Notification to the Tenderer's Authorized Representative named in the Tenderer Information Form]

1) For the attention of Tenderer's Authorized Representative Name: .....*[insert Authorized Representative's name]*

Address: ..... *[insert Authorized Representative's Address]*

Telephone/Fax numbers: ..... *[insert Authorized Representative' s telephone /fax numbers]*

Email Address: ..... *[insert Authorized Representative's email address]*

[IMPORTANT: insert the date that this Notification is transmitted to Tenderers. The Notification must be sent to all Tenderers simultaneously. This means on the same date and as close to the same time as possible.]

DATE OF TRANSMISSION: This Notification is sent by: *[email/fax] on [date] (local time)*

Notification of Intention to Award

Procuring Entity: .....*[insert the name of the Procuring Entity]* Project: .....*[insert name of project]*

Contract title: .....*[insert the name of the contract]*

ITT No: ..... *[insert ITT reference number from Procurement Plan]*

This Notification of Intention to Award (Notification) notifies you of our decision to award the above contract. The transmission of this Notification begins the Standstill Period. During the Standstill Period, you may:

a) Request a debriefing in relation to the evaluation of your Tender, and/or

b) Submit a Procurement-related Complaint in relation to the decision to award the contract.

2) The Successful Tenderer

Name:	[*insert name of successful Tenderer*]
Address:	[*insert address of the successful Tenderer*]
Contract price:	[*insert contract price of the successful Tender*]

3) Other Tenderers *[INSTRUCTIONS: insert names of all Tenderers that submitted a Tender. If the Tender's price was evaluated include the evaluated price as well as the Tender price as read out.]*

Name of Tenderer	**Tender price**	**Evaluated Tender Cost**
[*insert name*]	[*insert Tender price*]	[*insert evaluated* **cost**]

[*insert name*]	[*insert Tender price*]	[*insert evaluated cost*]
[*insert name*]	[*insert Tender price*]	[*insert evaluated cost*]

4) Reason/s why your Tender was unsuccessful

[INSTRUCTIONS: *State the reasons/why this Tenderer's Tender was unsuccessful. Do NOT include: (a) appoint by point comparison with another Tenderer's Tender, or (b) information that is marked "Confidential" by the Tenderer in its Tender.]*

5) How to request a debriefing?

DEADLINE: *The deadline to request a debriefing expires at midnight on [insert date] (local time).*
You may request a debriefing in relation to the results of the evaluation of your Tender. If you decide to request a debriefing, your written request must be made within three (3) Business Days of receipt of this Notification of Intention to Award.
Provide the contract name, reference number, name of the Tenderer, contact details; and address the request for debriefing as follows:

Attention: .....[insert full name of person, if applicable]

Title/position: .....[insert title/position]

Agency: .....[insert name of Procuring Entity]

Email address: .....[insert email address]

Fax number: .....[insert fax number] delete if not used

If your request for a debriefing is received within the 3 Business Days deadline, we will provide the debriefing within five (5) Business Days of receipt of your request. If we are unable to provide the debriefing within this period, the Standstill Period shall be extended by five (5) Business Days after the date that the debriefing is provided. If this happens, we will notify you and confirm the date that the extended Standstill Period will end.

The debriefing may be in writing, by phone, video conference call or in person. We shall promptly advise you in writing how the debriefing will take place and confirm the date and time.

If the deadline to request a debriefing has expired, you may still request a debriefing. In this case, we will provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of the Contract Award Notice.

6) How to make a complaint,

Period: Procurement-related Complaint challenging the decision to award shall be submitted by midnight, [insert date] (local time).

Provide the contract name, reference number, name of the Tenderer, contact details; and address the Procurement- related Complaint as follows:

Attention: .....[insert full name of person, if applicable]

Title/position: ....[insert title/position]

Agency: .....[insert name of Procuring Entity]

Email address: .....[insert email address]

Fax number: .....[insert fax number] delete if not used

At this point in the procurement process, you may submit a Procurement-related Complaint challenging the decision to award the contract. You do not need to have requested, or received, a debriefing before making this complaint. Your complaint must be submitted within the Standstill Period and received by us before the Standstill Period ends.

Further information:

Further information: For more information refer to the Public Procurement and Disposals Act 2015 and its Regulations available from the Website: info@ppra.go.ke or complaints@ppra.go.ke.

In summary, there are four essential requirements:

1. *You must bean' interested party'. In this case, that means a Tenderer who submitted a Tender in this Tendering process, and is the recipient of a Notification of Intention to Award.*
2. *The complaint can only challenge the decision to award the contract.*
3. *You must submit the complaint within the period stated above.*
4. *You must include, in your complaint, all of the information required by the Procurement Regulations (as described in Annex III).*

7) Standstill Period

DEADLINE: *The Standstill Period is due to end at midnight on [insert date] (local time).*
The Standstill Period lasts ten (10) Business Days after the date of transmission of this Notification of Intention to Award.

The Standstill Period may be extended as stated in Section 4 above.

If you have any questions regarding this Notification please do not hesitate to contact us. On behalf of the Procuring Entity:

Signature: _____

Name: _____

Title/position: _____

Telephone: _____

Email: _____

REQUEST FOR REVIEW

FORM FOR REVIEW (r.203(1))

PUBLIC PROCUREMENT ADMINISTRATIVE REVIEW BOARD

APPLICATION NO……. OF……20……..

BETWEEN

……. APPLICANT

AND

……RESPONDENT (Procuring Entity)

Request for review of the decision of the…… (Name of the Procuring Entity of ……dated the…day of ……..20…….in the matter of Tender No……..…of ……..20…. for .....(Tender description).

REQUEST FOR REVIEW

I/We……, the above named Applicant(s), of address: Physical address……. P. O. Box No……. Tel. No……. Email ……, hereby request the Public Procurement Administrative Review Board to review the whole/part of the above mentioned decision on the following grounds, namely:

1.

2.

By this memorandum, the Applicant requests the Board for an order/orders that:

1.

2.

SIGNED …….. (Applicant) Dated on……. day of ……/…20……

FOR OFFICIAL USE ONLY Lodged with the Secretary Public Procurement Administrative Review Board on……day of ……..20…….

SIGNED

Board Secretary

LETTER OF AWARD

To:____

This is to notify you that your Tender dated_____for execution of the_____for the Contract Price in the aggregate of_____, as corrected and modified in accordance with the Instructions to Tenderers is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms included in Section X, - Contract Forms, of the Tendering document.

Authorized Signature: .....

Name and Title of Signatory: .....

Name of Agency: .....

Attachment: Contract Agreement: .....

CONTRACT AGREEMENT

THIS AGREEMENT is made the_____day of_____, _____, BETWEEN

1) ……a corporation incorporated under the laws of_____and having its principal place of business at …….. (hereinafter called "the Procuring Entity"), and (2) ____, a corporation incorporated under the laws of_____and having its principal place of business at____(herein after called "the Contractor").

WHEREAS the Procuring Entity desires to engage the Contractor to design, manufacture, test, deliver, install, complete and commission certain Facilities, viz._____("the Facilities"), and the Contractor has agreed to such engagement upon and subject to the terms and conditions herein after appearing.

NOW IT IS HEREBYAGREED as follows:

Article 1. Contract Documents

1.1 Contract Documents (Reference GCC Clause2)

The following documents shall constitute the Contract between the Procuring Entity and the Contractor, and each shall be read and construed as an integral part of the Contract:

a) This Contract Agreement and the Appendices hereto

b) Form of Tender and Price Schedules submitted by the Contractor

c) Special Conditions of Contract

d) General Conditions of Contract

e) Specification

f) Drawings

g) Other completed Tendering forms submitted with the Tender

h) Any other documents forming part of the Procuring Entity's Requirements

i) Any other documents shall be added here

1.2 Order of Precedence (Reference GCC Clause2)

In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article1.1(Contract Documents) above.

1.3 Definitions (Reference GCC Clause1)

Capitalized words and phrases used here in shall have the same meanings as ascribed to them in the General Conditions.

Article 2. Contract Price and Terms of Payment

2.1 Contract Price (Reference GCC Clause11)

The Procuring Entity hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be the aggregate of:

……as specified in Price Schedule No 5 (Grand Summary),

and____,_____, or such other sums as may be determined in accordance with the terms and conditions of the Contract.

2.2 Terms of Payment (Reference GCC Clause 12)

The terms and procedures of payment according to which the Procuring Entity will reimburse the Contractor are given in the Appendix (Terms and Procedures of Payment) hereto.

The Procuring Entity may instruct its bank to issue an irrevocable confirmed documentary credit made available to the Contractor in a bank in the country of the Contractor. The credit shall be for an amount of and shall be subject to the Uniform Customs and Practice for Documentary Credits 2007 Revision, ICC Publication No.600.

In the event that the amount payable under Schedule No.1 is adjusted in accordance with GCC 11.2 or with any of the other terms of the Contract, the Procuring Entity shall arrange for the documentary credit to be amended accordingly.

Article 3. Effective Date

3.1 Effective Date (Reference GCC Clause1)

The Effective Date from which the Time for Completion of the Facilities shall be counted is the date when all of the following conditions have been fulfilled:

a) This Contract Agreement has been duly executed for and on behalf of the Procuring Entity and the Contractor;

b) The Contractor has submitted to the Procuring Entity the Performance Security and the advance payment guarantee;

c) The Procuring Entity has paid the Contractor the advance payment

d) The Contractor has been advised that the documentary credit referred to in Article 2.2 above has been issued in its favour.

Each party shall use its best efforts to fulfil the above conditions for which it is responsible as soon as practicable.

3.2 If the conditions listed under 3.1 are not fulfilled within two (2) months from the date of this Contract notification because of reasons not attributable to the Contractor, the Parties shall discuss and agree on an equitable adjustment to the Contract Price and the Time for Completion and/or other relevant conditions of the Contract.

Article 4. Communications

4.1 The address of the Procuring Entity for notice purposes, pursuant to GCC 4.1is:_____.

4.2 The address of the Contractor for notice purposes, pursuant to GCC 4.1is:_____.

Article 5. Appendices

5.1 The Appendices listed in the attached List of Appendices shall be deemed to form an integral part of this Contract Agreement.

5.2 Reference in the Contract to any Appendix shall mean the Appendices attached here to, and the Contract shall be read and construed accordingly.

IN WITNESS WHEREOF the Procuring Entity and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.

Signed by, for and on behalf of the Procuring Entity

.....*[Signature]*

.....*[Title]*

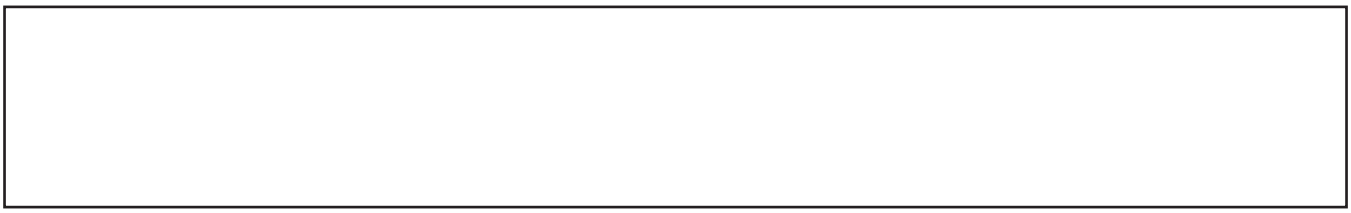
in the presence of

Signed by, for and on behalf of the Contractor

.....*[Signature]*

.....*[Title]*

in the presence of



APPENDIX 1: TERMS AND PROCEDURES OF PAYMENT

In accordance with the provisions of GCC Clause12 (Terms of Payment), the Procuring Entity shall pay the Contractor in the following manner and at the following times, on the basis of the Price Break down given in the section on Price Schedules. Payments will be made in the currencies quoted by the Tenderer unless otherwise agreed between the Parties. Applications for payment in respect of part deliveries may be made by the Contractor as work proceeds.

TERMS OF PAYMENT

Schedule No. 1. Plant and Equipment Supplied from Abroad

In respect of plant and equipment supplied from abroad, the following payments shall be made:

Ten percent (10%) of the total CIP amount as an advance payment against receipt of invoice and an irrevocable advance payment security for the equivalent amount made out in favor of the Procuring Entity. The advance payment security may be reduced in proportion to the value of the plant and equipment delivered to the site, as evidenced by shipping and delivery documents.

Eighty percent (80%)of the total or pro rata CIP amount upon Incoterm "CIP", upon delivery to the carrier within forty- five (45) days after receipt of documents.

Five percent (5%) of the total or pro rata CIP amount upon issue of the Completion Certificate, within forty-five (45) days after receipt of invoice.

Five percent (5%) of the total or pro rata CIP amount upon issue of the Operational Acceptance Certificate, within forty- five (45) days after receipt of invoice.

Schedule No. 2. Plant and Equipment Supplied from within Kenya

In respect of plant and equipment supplied from Kenya, the following payments shall be made:

Ten percent (10%) of the total EXW amount as an advance payment against receipt of invoice, and an irrevocable advance payment security for the equivalent amount made out in favour of the Procuring Entity. The advance payment security may be reduced in proportion to the value of the plant and equipment delivered to the site, as evidenced by shipping and delivery documents.

Eighty percent (80%) of the total or pro rata EXW amount upon Incoterm "Ex-Works," upon delivery to the carrier within forty-five (45) days after receipt of invoice and documents.

Five percent (5%) of the total or pro rata EXW amount upon issue of the Completion Certificate, within forty-five (45) days after receipt of invoice.

Five percent (5%) of the total or pro rata EXW amount upon issue of the Operational Acceptance Certificate, within forty-five (45) days after receipt of invoice.

Schedule No. 3. Design Services

In respect of design services for both the foreign currency and the local currency portions, the following payments shall be made:

Ten percent (10%) of the total design services amount as an advance payment against receipt of invoice, and an irrevocable advance payment security for the equivalent amount made out in favour of the Procuring Entity.

Ninety percent (90%) of the total or pro rata design services amount upon acceptance of design in accordance with GCC Clause 20 by the Project Manager within forty-five (45) days after receipt of invoice.

Schedule No. 4. Installation Services

In respect of installation services for both the foreign and local currency portions, the following payments shall be made:

Ten percent (10%) of the total installation services amount as an advance payment against receipt of invoice, and an irrevocable advance payment security for the equivalent amount made out in favor of the Procuring Entity. The advance payment security may be reduced in proportion to the value of work performed by the Contractor as evidenced by the invoices for installation services.

Eighty percent (80%) of the measured value of work performed by the Contractor, as identified in the said Program of Performance, during the preceding month, as evidenced by the Procuring Entity's authorization of the Contractor's application, will be made monthly within forty-five (45) days after receipt of invoice.

Five percent (5%) of the total or pro rata value of installation services performed by the Contractor as evidenced by the Procuring Entity's authorization of the Contractor's monthly applications, upon issue of the Completion Certificate, within forty-five (45) days after receipt of invoice.

Five percent (5%) of the total or pro rata value of installation services performed by the Contractor as evidenced by the Procuring Entity's authorization of the Contractor's monthly applications, upon issue of the Operational Acceptance Certificate, within forty-five (45) days after receipt of invoice.

In the event that the Procuring Entity fails to make any payment on its respective due date, the Procuring Entity shall pay to the Contractor interest on the amount of such delayed payment at the rate of _____] percent (%) per month for period of delay until payment has been made in full.

PAYMENT PROCEDURES

The procedures to be followed in applying for certification and making payments shall be as follows:

_____

APPENDIX 2. PRICE ADJUSTMENT

Where the Contract Period (excluding the Defects Liability Period) exceeds eighteen (18) months, it is normal procedure that prices payable to the Contractor shall be subject to adjustment during the performance of the Contract to reflect changes occurring in the cost of labor and material components. In such cases the Tendering document shall include in this Appendix 2 a formula of the following general type, pursuant to GCC Sub-Clause 11.2.

Where Contracts are of a shorter duration than eighteen (18) months or in cases where there is to be no Price Adjustment, the following provision shall not be included. Instead, it shall be indicated under this Appendix 2 that the prices are to remain firm and fixed for the duration of the Contract.

Sample Price Adjustment Formula

If in accordance with GCC 11.2, prices shall be adjustable, the following method shall be used to calculate the price adjustment:

Prices payable to the Contractor, in accordance with the Contract, shall be subject to adjustment during performance of the Contract to reflect changes in the cost of labor and material components, in accordance with the following formula:

$$P_1 = P_0 \times (a + b\frac{L_1}{L_0} + c\frac{M_1}{M_0}) - P_0$$

in which:

P_1 = adjustment amount payable to the Contractor

P_0 = Contract price (base price)

a = percentage of fixed element in Contract price (a = %)

b = percentage of labor component in Contract price (b= %)

c = percentage of material and equipment component in Contract price (c= %)

L_0, L_1 = labor indices applicable to the appropriate industry in the country of origin on the base date and the date for adjustment, respectively

M_0, M_1= material and equipment indices in the country of origin on the base date and the date for adjustment, respectively

N.B. a+b+c= 100%.

Conditions Applicable to Price Adjustment

The Tenderer shall indicate the source of labor and materials indices, source of exchange rates and the base date indices in its Tender.

Item Source of Indices Used Base Date Indices

The base date shall be the date twenty-eight (28) days prior to the Tender closing date.

The date of adjustment shall be the mid-point of the period of manufacture or installation of component or Plant.

The following conditions shall apply:

(a) No price increase will be allowed beyond the original delivery date unless covered by an extension of time awarded by the Procuring Entity under the terms of the Contract. No price increase will be allowed for periods of delay for which the Contractor is responsible. The Procuring Entity will, however, be entitled to any price decrease occurring during such periods of delay.

(b) If the currency in which the Contract price, P0, is expressed is different from the currency of the country of origin of the labor and/or materials indices, a correction factor will be applied to avoid incorrect adjustments of the Contract price. The correction factor shall be: Z0 / Z1, where,

Z_0 = the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price P_0 on the Base date, and

Z_1 = the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price P_0 on the Date of Adjustment.

(c) No price adjustment shall be payable on the portion of the Contract price paid to the Contractor as an advance payment.

APPENDIX 3. INSURANCE REQUIREMENTS

Insurances to be Taken Out by the Contractor

In accordance with the provisions of GCC Clause 34, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the Procuring Entity, such approval not to be unreasonably withheld.

a) Cargo Insurance

Covering loss or damage occurring, while in transit from the supplier's or manufacturer's works or stores until arrival at the Site, to the Facilities (including spare parts therefor) and to the construction equipment to be provided by the Contractor or its Subcontractors.

Amount Deductible Limits Parties insured from To

b) Installation All Risks Insurance

Covering physical loss or damage to the Facilities at the Site, occurring prior to completion of the Facilities, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the defect liability period while the Contractor is on the Site for the purpose of performing its obligations during the defect liability period.

Amount Deductible Limits Parties insured from To

c) Third Party Liability Insurance

Covering bodily injury or death suffered by third parties (including the Procuring Entity's personnel) and loss of or damage to property (including the Procuring Entity's property and any parts of the Facilities that have been accepted by the Procuring Entity) occurring in connection with the supply and installation of the Facilities.

Amount Deductible Limits Parties insured from To

d) Automobile Liability Insurance

Covering use of all vehicles used by the Contractor or its Subcontractors (whether or not owned by them) in connection with the supply and installation of the Facilities. Comprehensive insurance in accordance with statutory requirements.

e) Workers' Compensation

In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

f) Procuring Entity's Liability

In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

g) Other Insurances

The Contractor is also required to take out and maintain at its own cost the following insurances:

Details:

Amount Deductible LimitsParties insured from To The Procuring Entity shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1, except for the Third-Party Liability, Workers' Compensation and Procuring Entity's Liability Insurances, and the Contractor's Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1, except for the Cargo, Workers' Compensation and Procuring Entity's Liability Insurances. All insurer's rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.

Insurances to Be Taken Out by The Procuring Entity

The Procuring Entity shall at its expense take out and maintain in effect during the performance of the Contract the following insurances.

Details:

Amount Deductible Limits Parties insured from_____
To_____

APPENDIX 4. TIME SCHEDULE

APPENDIX 5. LIST OF MAJOR ITEMS OF PLANT AND INSTALLATION SERVICES AND LIST OF APPROVED SUBCONTRACTORS

A list of major items of Plant and Installation Services is provided below.

The following Subcontractors and/or manufacturers are approved for carrying out the items of the Facilities indicated below. Where more than one Subcontractor is listed, the Contractor is free to choose between them, but it must notify the Procuring Entity of its choice in good time prior to appointing any selected Subcontractor. In accordance with GCC Sub-Clause 19.1, the Contractor is free to submit proposals for Subcontractors for additional items from time to time. No Subcontracts shall be placed with any such Subcontractors for additional items until the Subcontractors have been approved in writing by the Procuring Entity and their names have been added to this list of Approved Subcontractors.

Major Items of Plant and Installation Services	**Approved Subcontractors/Manufacturers**	**Nationality**

APPENDIX 6. SCOPE OF WORKS AND SUPPLY BY THE PROCURING ENTITY

The following personnel, facilities, works and supplies will be provided/supplied by the Procuring Entity, and the provisions of GCC Clauses 10, 21 and 24 shall apply as appropriate.

All personnel, facilities, works and supplies will be provided by the Procuring Entity in good time so as not to delay the performance of the Contractor, in accordance with the approved Time Schedule and Program of Performance pursuant to GCC Sub-Clause18.2.

Unless otherwise indicated, all personnel, facilities, works and supplies will be provided free of charge to the Contractor.

Personnel	Charge to Contractor (if any)
Facilities	Charge to Contractor (if
Works	Charge to Contractor (if
Supplies	Charge to Contractor (if

APPENDIX 7. LIST OF DOCUMENTS FOR APPROVAL OR REVIEW

Pursuant to GCC Sub-Clause 20.3.1, the Contractor shall prepare, or cause its Subcontractor to prepare, and present to the Project Manager in accordance with the requirements of GCC Sub-Clause 18.2 (Program of Performance), the following documents for

A. Approval

1.

2.

3.

B. Review

1.

2.

3.

APPENDIX 8. FUNCTIONAL GUARANTEES

1. General

This Appendix sets out

a) The functional guarantees referred to in GCC Clause 28 (Functional Guarantees)

b) The pre-conditions to the validity of the functional guarantees, either in production and/or consumption, set forth below

c) The minimum level of the functional guarantees

d) The formula for calculation of liquidated damages for failure to attain the functional guarantees.

2. Preconditions

The Contractor gives the functional guarantees (specified herein) for the facilities, subject to the following preconditions being fully satisfied:

3. Functional Guarantees

Subject to compliance with the foregoing preconditions, the Contractor guarantees as follows:

3.1 Production Capacity

and/or

3.2 Raw Materials and Utilities Consumption

4. Failure in Guarantees and Liquidated Damages

4.1 Failure to Attain Guaranteed Production Capacity

If the production capacity of the facilities attained in the guarantee test, pursuant to GCC Sub-Clause 25.2, is less than the guaranteed figure specified in para. 3.1 above, but the actual production capacity attained in the guarantee test is not less than the minimum level specified in para. 4.3 below, and the Contractor elects to pay liquidated damages to the Procuring Entity in lieu of making changes, modifications and/or additions to the Facilities, pursuant to GCC Sub-Clause 28.3, then the Contractor shall pay liquidated damages at the rate of……. for every complete one percent (1%) of the deficiency in the production capacity of the Facilities, or at a proportionately reduced rate for any deficiency, or part

thereof, of less than a complete one percent (1%).

4.2 Raw Materials and Utilities Consumption in Excess of Guaranteed Level

If the actual measured figure of specified raw materials and utilities consumed per unit (or their average total cost of consumption) exceeds the guaranteed figure specified in para.3.2 above (or their specified average total cost of consumption), but the actual consumption attained in the guarantee test, pursuant to GCC Sub-Clause 25.2, is not more than the maximum level specified in para. 4.3 below, and the Contractor elects to pay liquidated damages to the Procuring Entity in lieu of making changes, modifications and/or additions to the Facilities pursuant to GCC Sub-Clause 28.3, then the Contractor shall pay liquidated damages at the rate of [amount in the contract currency] for every complete one percent (1%) of the excess consumption of the Facilities, or part thereof, of less than a complete one percent (1%).

4.3 Minimum Levels

Notwithstanding the provisions of this paragraph, if as a result of the guarantee test(s), the following minimum levels of performance guarantees (and consumption guarantees) are not attained by the Contractor, the Contractor shall at its own cost make good any deficiencies until the Facilities reach any of such minimum performance levels, pursuant to GCC Sub-Clause 28.2:

a) production capacity of the Facilities attained in the guarantee test: ninety-five percent (95%) of the guaranteed production capacity (the values offered by the Contractor in its Tender for functional guarantees represents 100%).

and/or

b) average total cost of consumption of all the raw materials and utilities of the Facilities: one hundred and five percent (105%) of the guaranteed figures (the figures offered by the Contractor in its Tender for functional guarantees represents 100%).

4.4 Limitation of Liability

Subject to para.4.3 above, the Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantees shall not exceed ____ percent (_____%) of the Contract price.

PERFORMANCE SECURITY FORM

OPTION 1 – Demand Bank Guarantee

[Guarantor Form head or SWIFT identifier code]

Beneficiary:_____*[insert name and Address of Procuring Entity]*

Date:__*[Insert date of issue]*

PERFORMANCE GUARANTEE No.:_____*[Insert guarantee reference number]*

Guarantor:_____*[Insert name and address of place of issue, unless indicated in the Form head]*

We have been informed that_____(herein after called "the Applicant") has entered into Contract No. _____dated _____with the Beneficiary, for the execution of

(herein after called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of____(_____)[1],such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation (s) under the Contract, without the Beneficiary needing to prove or to show grounds for your demand or the sum specified there in.

This guarantee shall be reduced by half upon our receipt of:

a) A copy of the Operational Acceptance Certificate; or

b) a registered Form from the Applicant (i) attaching a copy of its notice requesting issuance of the Operational Acceptance Certificate and (ii) stating that the Project Manager has failed to issue such Certificate within the time required or provide in writing justifiable reasons why such Certificate has not been issued, so that Operational Acceptance is deemed to have occurred.

This guarantee shall expire no later than the earlier of:[2]

a) twelve months after our receipt of either (a) or (b) above; or

b) eighteen months after our receipt of:

i) a copy of the Completion Certificate; or

ii) a registered Form from the Applicant, attaching a copy of the notice to the Project Manager that the Facilities are ready for commissioning, and stating that fourteen days have elapsed from receipt of such notice (or seven days have elapsed if the notice was a repeated notice) and the Project Manager has failed to issue a Completion Certificate or in form the Applicant in writing of any defects or deficiencies;

or

iii) a registered Form from the Applicant stating that no Completion Certificate has been issued but the Procuring Entity is making use of the Facilities; or

c) the____day of_____,2____.[3]

Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No.758, except that the supporting statement under Article15 (a) is hereby excluded.

.

[signature(s)]

Note: *All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.*

[1]*The Guarantor shall insert an amount representing the percentage of the Contract Price specified in the Contract and denominated either in the currency(ies) of the Contract or a freely convertible currency acceptable to the Procuring Entity.*

[2]*This text shall be revised as and where necessary to take into account*

(i) *partial acceptance of the Facilities in accordance with Sub-Clause 25.4 of the GCC; and*

(ii) *extension of the Performance Security when the Contractor is liable for an extended warranty obligation pursuant to Sub-Clause 27.10 of the GCC (although in this latter case the Procuring Entity might want to consider an extended warranty security in lieu of the extension of the Performance Security).*

[3]*Insert the date twenty-eight days after the expected expiration date of the Defect Liability Period. The Procuring Entity should note that in the event of an extension of the time for completion of the Contract, the Procuring Entity would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Procuring Entity might consider adding the following text to the form, at the end of the pen ultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months] [one year], in response to the Procuring Entity's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."*

PERFORMANCE SECURITY

OPTION 2 – (Performance Bond)

[Note: Procuring Entities are advised to use Performance Security–Unconditional Demand Bank Guarantee instead of Performance Bond due to difficulties involved in calling Bond holder to action]

[Guarantor Form head or SWIFT identifier code]

Beneficiary:_____*[insert name and Address of Procuring Entity]*

Date:__*[Insert date of issue]*

PERFORMANCE BOND No.:_____

Guarantor:_____*[Insert name and address of place of issue, unless indicated in the Form head]*

1. By this Bond _____ as Principal (herein after called "the Contractor") and_____] as Surety (herein after called "the Surety"), are held and firmly bound unto_____] as Obliged (herein after called "the Procuring Entity") in the amount of_____for the payment of which sum well and truly to be made in the types and proportions of currencies in which the Contract Price is payable, the Contractor and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

2. WHEREAS the Contractor has entered in to a written Agreement with the Procuring Entity dated the day of,20, for_____in accordance with the documents, plans, specifications, and amendments there to, which to the extent herein provided for, are by reference m a depart here of and are herein after referred to as the Contract.

3. NOW, THEREFORE, the Condition of this Obligation is such that, if the Contractor shall promptly and faithfully perform the said Contract (including any amendments there to), then this obligation shall be null and void; otherwise, it shall remain in full force and effect. Whenever the Contractor shall be, and declared by the Procuring Entity to be, in default under the Contract, the Procuring Entity having performed the Procuring Entity's obligations there under, the Surety may promptly remedy the default, or shall promptly:

1) Complete the Contract in accordance with its terms and conditions; or

2) Obtain a tender or tenders from qualified tenderers for submission to the Procuring Entity for completing the Contract in accordance with its terms and conditions, and upon determination by the Procuring Entity and the Surety of the lowest responsive Tenderers, arrange for a Contract between such Tenderer, and Procuring Entity and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the Balance of the Contract Price; but not exceeding, including other costs and damages for which the Surety may be liable here under, the amount set for thin the first paragraph hereof. The term "Balance of the Contract Price," as used in this paragraph, shall mean the total amount payable by Procuring Entity to Contractor under the Contract, less the amount properly paid by Procuring Entity to Contractor; or

3) Pay the Procuring Entity the amount required by Procuring Entity to complete the Contract in accordance with its terms and conditions up to a total not exceeding the amount of this Bond.

4. The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

5. Any suit under this Bond must be instituted before the expiration of one year from the date of the issuing of the Taking-Over Certificate. No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Procuring Entity named here in or the heirs, executors, administrators, successors, and assigns of the Procuring Entity.

6. In testimony whereof, the Contractor has hereunto set his hand and affixed his seal, and the Surety has caused these presents to be sealed with his corporate seal duly attested by the signature of his legal representative, this day_____of_____20_____.

SIGNED ON_____on behalf of

By_____in the capacity of in the presence of

SIGNED ON_____on behalf of

By_____in the capacity of in the presence of

ADVANCE PAYMENT SECURITY - Demand Bank Guarantee

[Guarantor Form head or SWIFT identifier code]

Beneficiary: _____ *[Name and Address of Procuring Entity]*

Date: _____ *[Insert date of issue]*

Advance Payment Guarantee No.: _____ *[Insert guarantee reference number]*

Guarantor: _____ *[Insert name and address of place of issue, unless indicated in the Form head]*

We have been informed that _____ (herein after called "the Applicant") has entered into Contract No. _____ dated _____ with the Beneficiary, for the execution of, _____ (herein after called "the Contract").

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum _____ (_____) is to be made against an advance payment guarantee.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of (_)[4] upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the applicant:

a) Has used the advance payment for purposes other than the costs of mobilization in respect of the Facilities; or

b) has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Applicant has failed to repay.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the advance payment referred to above has been credited to the Applicant on its account number ___ at ___.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Applicant as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of documentation indicating full repayment by the Applicant of the amount of the advance payment, or on the ___ day of _____, _____[5], whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15 (a) is hereby excluded.

_____ *[signature(s)]*

Note: *All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.*

4The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency(ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the Procuring Entity.

5Insert the expected expiration date of the Time for Completion. The Procuring Entity should note that in the event of an extension of the time for completion of the Contract, the Procuring Entity would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Procuring Entity might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months] [one year], in response to the

Beneficiary'swrittenrequestforsuchextension,suchrequesttobepresentedtotheGuarantorbeforetheexpiryoftheguarantee."

BENEFICIAL OWNERSHIP DISCLOSURE FORM

(Amended and issued pursuant to PPRA CIRCULAR No. 02/2022)

INSTRUCTIONS TO TENDERERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE FORM

This Beneficial Ownership Disclosure Form ("Form") is to be completed by the successful tendered pursuant to Regulation 13 (2A) and 13 (6) of the Companies (Beneficial Ownership Information) Regulations, 2020. In case of joint venture, the tenderer must submit a separate Form for each member. The beneficial ownership information to be submitted in this Form shall be current as of the date of its submission.

For the purposes of this Form, a Beneficial Owner of a Tenderer is any natural person who ultimately owns or controls the legal person (tenderer) or arrangements or a natural person on whose behalf a transaction is conducted, and includes those persons who exercise ultimate effective control over a legal person (Tenderer) or arrangement.

Tender Reference No.:_____[*insert identification no*] Name of the Tender Title/Description:_____*[insert name of the assignment]* to:_____*[insert complete name of Procuring Entity]*

In response to the requirement in your notification of award dated_____*[insert date of notification of award]* to furnish additional information on beneficial ownership:_____*[select one option as applicable and delete the options that are not applicable]*

I) We here by provide the following beneficial ownership information.

Details of beneficial ownership

	Details of all Beneficial Owners		**% of shares a person holds in the company Directly or indirectly**	**% of voting rights a person holds in the company**	**Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No)	**Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)**
1.	Full Name		Directly---------- % of shares Indirectly---------- % of shares	Directly…….. % of voting rights Indirectly---------- % of voting rights	1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -------No---- 2. Is this right held directly or indirectly?:	1. Exercises significant influence or control over the Company body of the Company (tenderer**)** Yes -----No----
	National identity card number or Passport number					
	Personal Identification Number (where applicable)					
	Nationality					
	Date of birth *[dd/mm/yyyy]*					
	Postal address					

	Details of all Beneficial Owners		**% of shares a person holds in the company Directly or indirectly**	**% of voting rights a person holds in the company**	**Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No)	**Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)**
	Residential address				Direct…… Indirect……..	2. Is this influence or control exercised directly or indirectly? Direct…….. Indirect……
	Telephone number					
	Email address					
	Occupation or profession					
2.	Full Name		Directly---------- % of shares Indirectly---------- % of shares	Directly…….. % of voting rights Indirectly---------- % of voting rights	1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No---- 2. Is this right held directly or indirectly?: Direct…… Indirect……..	1. Exercises significant influence or control over the Company body of the Company (tenderer**)** Yes -----No---- 2. Is this influence or control exercised directly or indirectly? Direct…….. Indirect……
	National identity card number or Passport number					
	Personal Identification Number (where applicable)					
	Nationality(ies)					
	Date of birth *[dd/mm/yyyy]*					
	Postal address					
	Residential address					
	Telephone number					
	Email address					
	Occupation or profession					
3.						
e.t .c						

II) Am fully aware that beneficial ownership information above shall be reported to the Public Procurement Regulatory Authority together with other details in relation to contract awards and shall be maintained in the Government Portal, published and made publicly available pursuant to Regulation 13(5) of the Companies (Beneficial Ownership Information) Regulations, 2020.(Notwithstanding this paragraph Personally Identifiable Information in line with the Data Protection Act shall not be published or made public). *Note that Personally Identifiable Information (PII) is defined as any information that can be used to distinguish one person from another and can be used to deanonymize previously anonymous data. This information includes National identity card number or Passport number, Personal Identification Number, Date of birth, Residential address, email address and Telephone number.*

III) In determining who meets the threshold of who a beneficial owner is, the Tenderer must consider a natural person who in relation to the company:

(a) holds at least ten percent of the issued shares in the company either directly or indirectly;

(b) exercises at least ten percent of the voting rights in the company either directly or indirectly;

(c) holds a right, directly or indirectly, to appoint or remove a director of the company; or

(d) exercises significant influence or control, directly or indirectly, over the company.

IV) What is stated to herein above is true to the best of my knowledge, information and belief.

Name of the Tenderer: .....[insert complete name of the Tenderer]*_____

*Name of the person duly authorized to sign the Tender on behalf of the Tenderer: ** [insert complete name of person duly authorized to sign the Tender]*

Designation of the person signing the Tender: ..... [insert complete title of the person signing the Tender]

Signature of the person named above: ..... [insert signature of person whose name and capacity are shown above]

Date this ..... [insert date of signing] day of..... [Insert month], [insert year]

Bidder Official Stamp

SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT

TENDER NO: KAA/OT/MIA/0087/2024-2025

SCHEDULE OF RATES AND PRICES – BILLS OF QUANTITIES

FEBRUARY 2025

MANAGING DIRECTOR/CEO
KENYA AIRPORTS AUTHORITY
P.O. BOX 19001 - 00501
NAIROBI

GENERAL MANAGER (P&ES)
KENYA AIRPORTS AUTHORITY
P.O. BOX 19001 - 00501
NAIROBI

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
Bill No.1	**PRELIMINARIES & GENERAL CONDITIONS**				
1	**EMPLOYER**				
	The Employer is the Kenya Airports Authority. The terms "Employer" and "KAA" wherever used in any contract Document shall be synonymous				
2	**DEFINITION OF TERMS**				
A	'Approved' shall mean approved by the Project Manager at his absolute discretion				
B	'Directed' shall mean directed by the Project Manager at his absolute discretion				
C	'Selected' shall mean directed by the Project Manager at his absolute discretion				
D	'B.S.' - shall mean the current British Standard Specification published by the British Standards Institution, 2 Park Street, London, WIA 2BS, England				
E	'K.S.' - shall mean the current Kenya Standard Specification published by the Kenya Bureau of Standards Institution.				
F	CM - shall mean cubic metre SM - shall mean square metre LM - shall mean linear metre MM - shall mean millimetre KG - shall mean Kilogramme NO - shall mean Number				
G	Ditto - shall mean the whole of the preceding description except as qualifies in the description in which it occurs Where it occurs in descriptions of succeeding items it shall mean the same as in the first descriptions of the series in which it occurs except as qualified in the description concerned.				
H	KES - shall mean Kenya Shillings				
I	'As described' shall mean as described in the 'Descriptions of Materials and Workmanship ' contained in the Appendices to these Bills of Quantities and technical specifications				
3	**GROUPED SIZES**				
	Girths, depths, or sizes grouped together in the Bills of Quantities item descriptions by means of hyphenated upper and lower limits shall be interpreted as 'exceeding' the lower limit and 'not exceeding' the upper limit.				
4	**DESCRIPTION OF SITE**				
	The site of the proposed works is within KAA Moi international Airport (MIA)-Mombasa COUNTY. The Contractor is recommended to visit the site and will be deemed to have satisfied himself with regard to the conditions of the site.				
5	**DESCRIPTION OF THE WORKS**				
	The works in this contract comprise :-				
	I) Supply and Install, Test and Commission of substation equipment and switchgear and associated structural fittings				
	Ii) Supply and Install Cables & Cable Works				
	TOTAL OF BILL OF SHEET 1 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
	BILL OF QUANTITIES				
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
	Iii) Supply And Install of The Electrical Power Boards				
	Iv) Associated Mechanical Works				
	V) Associated Civil and Building Works				
6	**AREA TO BE OCCUPIED BY CONTRACTOR**				
	The area of the site which may be occupied by the Contractor for use as storage or for the erection of workshops etc. shall be defined on the site by the Project Manager and the Contractor must confine his activities to the areas so marked and must ensure that his own and his sub-contractors workmen do not trespass on the adjoining property or cause inconvenience to its occupiers.				
7	**SITE VISIT & EXAMINATION OF DRAWINGS**				
	The Contractor is recommended to examine the original drawings and to satisfy himself regarding their details and regarding the extent and the nature of the works and the method of construction involved, and visit the site to familiarize himself with all local conditions before tendering. He shall be deemed to have acquainted himself with the nature of the existing conditions or any other matter which may affect his tender. No claim arising from his failure to comply with this recommendation will be considered. Drawings may be seen by appointment at the office of the General Manager (P & ES), KAA, during normal working hours.	ITEM			
8	**VALUATION OF LUMP SUM COSTS.**				
	Lump sums entered in these Bills of Quantities against any item of Preliminaries and General Conditions will be included in appropriate valuations according to reasonable assessment of actual costs involved in the item. Any balance between this assessment and the actual sum entered in the Bills of Quantities will be included in subsequent valuations as monthly instalments over the balance of the Contract Period.	ITEM			
9	**PAYMENT FOR MATERIALS ON SITE**				
	All materials for incorporation in the works must be stored on or adjacent to the site before payment is effected, unless specifically exempted by the Project Manager. This is to include materials of the Contractor, Nominated Sub-Contractors, and Nominated Suppliers.	ITEM			
10	**CONTRACT AGREEMENT AND CONDITIONS**				
	The Instructions to Tenderers and Conditions of Contract shall be the 'Standard Tender Document for Procurement of SUPPLY AND INSTALLATION OF PLANT AND EQUIPMENT' EFFECTIVE 21st April, 2021, published by the Public Procurement Regulatory Authority (the Authority). For the purposes of this Contract the said Schedule of Conditions and any such note or amendments shall be read and construed together.	ITEM			
	TOTAL OF BILL OF SHEET 2 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
11	**TOOLS, PLANT, ETC.**				
	The Contractor shall allow for providing all ladders, tools, plant and transport required for the works, except in so far as may be specifically stated otherwise herein.	ITEM			
12	**SAFETY, HEALTH AND WELFARE OF WORKPEOPLE**				
	The Contractor shall allow for providing for the safety, health and welfare of workpeople and for complying with any relevant Ordinances, Regulations or Union Agreement.	ITEM			
13	**NATIONAL INSURANCE AND PENSIONS**				
	The Contractor shall allow for making any National Hospital Insurance and National Social Security Fund payments due in respect of workpeople.	ITEM			
14	**HOLIDAYS AND TRANSPORT FOR WORKPEOPLE**				
	The Contractor shall allow for providing holidays and transport for workpeople and for complying with any relevant Ordinances, Regulations or Union Agreement.	ITEM			
15	**TRAINING LEVY**				
	The Contractor's attention is drawn to Legal Notice No. 237 of October, 1971, which requires payment by the Contractor of a Training Levy on all contracts of more than Shs.50,000/ in value and his tender must include for all costs arising or resulting therefrom. Proof of payment of this Training Levy will be required.	ITEM			
16	**PROJECT VEHICLE**				
	Provide with driver, fuel, service and maintain, insure 2No. Brand new 4WD vehicle, diesel engine capacity 2800-3000 cc for exclusive use of the Engineer inclusive of the first 5,000 km per vehicle month to Engineer's approval. Vehicle to revert back to the contractor.	Vehicle/ months	24		
17	**PROTECTION OF WORKS AND PERSONS**				
	The Contractor shall allow for the protection of his own and his Sub Contractor's work liable to damage, including provision of temporary roofs, gutters, drains, etc., if necessary and shall case up, cover, or in other suitable ways protect all finished work liable to injury, to the satisfaction of the Project Manager, and shall at all times keep all paths and roads affected by the works in a safe and clear state, and shall use proper precautions to ensure the safety of all wheeled traffic and pedestrians. The Contractor shall allow for providing all watching, lighting, barriers, covering open trenches and protection of the works, including Sub Contract works, as may be necessary for the safety of the works and for the protection of the public and his own and Sub Contractors' employees. In the event of any damage or loss occurring to the works, or to materials or to any sewers, gullies, drains, paths, or other works on the site in temporary possession of the Contractor for the purpose of this Contract, either from the weather, want of proper protection, defects, theft, insufficiency of the works, or any other cause whatsoever during the progress of the works, or for any accident or damage to property or persons by reason of the said works, the Contractor alone shall be responsible and shall without extra charge, make good all damage and pay all costs incurred.	ITEM			

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
18	**STANDARDS LEVY AND STANDARDS ACTS**				
	The Contractor's attention is drawn to legal notice No. 267 of 1990 which requires payment by Contractors of an annual Standards Levy and his tender must include for all costs arising or resulting therefrom.	ITEM			
19	**NATIONAL CONSTRUCTION AUTHORITY LEVY**				
	The Contractor shall allow 0.5% of the Cost of construction as a levy payable to the National Construction Authority in accordance with Section 31 of National Construction Act No. 41 of 2011. Note that this must be paid before Commencement of the Works	ITEM			
20	**POLICE REGULATIONS**				
	The Contractor shall allow for complying with any relevant police regulations.	ITEM			
21	**PROCEDURE AND TIME FOR COMPLETION**				
	The Contractor shall proceed with the works in such manner and such order as the Project Manager may direct.	ITEM			
22	**PROGRAMME AND PROGRESS**				
	The Contractor shall furnish to the Project Manager, within 7days, for approval and display in the site offices, a program and progress chart devised in such a way that the lined program is shown and progress can be marked up as the work proceeds. The Contractor shall keep this chart up to date at all times.	ITEM			
23	**WORKING HOURS**				
	Generally there will be no restrictions on working hours. In the interest of the usage of the new property the employer may require that overtime be worked so as to complete the works as quickly as possible. The Contractor must allow for all costs in complying with the Project Managers instructions of working outside normal hours. No claims for extras in connection with this compliance will be entertained.	ITEM			
	TOTAL OF BILL OF SHEET 3 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
24	**DAYWORKS** The Project Manager, if in his opinion it is necessary or desirable, order in writing that any additional or substituted work shall be executed on a Daywork basis. The Contractor shall then be paid for such work in accordance with Daywork rates and percentage additions as inserted hereafter in these Bills of Quantities. The Contractor shall furnish to the Project Manager all receipts or vouchers as may be necessary to prove the amounts paid and before ordering materials shall submit to the Project Manager quotations for the same for his approval. In respect of all work executed on a Daywork basis the Contractor shall, during the continuance of such work, deliver each day to the Project Manager a list in duplicate of the names, occupation and time of all workmen employed on such work and a statement also in duplicate showing the description and quantity of all materials and plant used thereon or therefore (other than plant which is included in the percentage addition on net amount of wages). One copy of each list and statement will, if correct or when agreed, be signed by the Project Manager and returned to the Contractor. At the end of each month the Contractor shall deliver to the Project Manager a priced statement of the labour, material and plant (except as aforesaid) used and the Contractor shall not be entitled to any Payment unless such lists and statements have been fully and punctually rendered. Provided always that, if the Project Manager shall consider that for any reason the sending of such list or statement by the Contractor in impracticable, he shall nevertheless be entitled to authorise payment for such work either as Daywork (on being satisfied as to the time employed and plant and materials used on such work) or at such value thereof as he shall consider fair and reasonable accordance with the foregoing provision was authorise payment for such work either as Daywork (on being satisfied as to the time employed and plant and materials used on such work) or at such value thereof as he shall consider fair and reasonable.	ITEM			
25	**WATER FOR THE WORKS**				
	The Contractor shall allow for providing all temporary water supplies required for the works, including Sub Contract works, together with all necessary storage tanks, meters and distribution systems for the same and must allow for bearing all expenses incurred and paying for all water consumed without charge to any Sub Contractor. Expenses in connection with Nominated Sub Contractors should be allowed for in the attendance items under the relevant P.C. Sums. Existing water supplies may be utilized by agreement with the Employer who however gives no undertaking as to the sufficiency or suitability of existing supplies.	**ITEM**			
	TOTAL OF BILL OF SHEET 4 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
26	**LIGHTING AND POWER FOR THE WORKS** The Contractor shall allow for providing all temporary lighting and power supplies required for the works, including Sub Contract works, together with all necessary meters and distribution systems for the same and must allow for bearing all expenses incurred and paying for all current consumed without charge to any Sub Contractor. Expenses in connection with Nominated Sub Contractors should be allowed for in the attendance items under the relevant P.C. Sums. Existing mains power supplies may be utilized by agreement with the Employer who however gives no undertaking as to the sufficiency or suitability of existing supplies.	**ITEM**			
27	**SIGNPOST**				
	The Contractor shall erect and maintain a signpost describing the nature of the project, names of the consultants, names of the contractor and his sub-contractors and any other details as specified by the Project Manager for the entire duration of the project	ITEM			
28	**SITE OFFICES**				
	The Contractor must allow for erecting and maintaining on the site in such positions as may be directed, adequate site offices for the use of his own site staff and removing the same at completion and making good all surfaces disturbed. The site office shall have sufficient furniture to permit the Project Manager to hold site meetings in it. The site office shall conform to requirements set out in the drawings provided and shall be approved by the Project Manager. The Contractor shall also allow for providing, erecting and maintaining where directed a lock up hut containing a pedestal type water closet and wash basin for the sole use of the Project Manager and other consultants, including making temporary connections to drains and water supplies and paying all charges for connections, conservancy and water consumed. The Contractor shall also allow for providing the services of a sweeper, for keeping both office and closet in a clean and sanitary condition from the commencement to completion of the works; and for dismantling at completion and making good all disturbed surfaces. The office and closet shall be completed before the Contractor will be permitted to commence the works.	ITEM			
29	**SHEDS FOR STORAGE OF MATERIALS**				
	The Contractor shall provide, erect and maintain on the site, in such positions as may be directed, ample temporary watertight, lock up sheds for the proper storage and protection of cement and other materials liable to damage and shall remove same at completion and make good all surfaces disturbed. He shall also provide space for storage accommodation which Sub Contractors may wish to erect for themselves.	ITEM			
	TOTAL OF BILL OF SHEET 5 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
	BILL OF QUANTITIES				
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
30	**SPACE FOR STORAGE SHEDS AND SITE OFFICES**				
	The site is developed, so space for site offices and storage accommodation, as described above, will be extremely limited. The Contractor shall allow for all necessary temporary erection, dismantling and re-erection of site offices and storage sheds made necessary by the restricted nature of the site.	ITEM			
31	**SANITATION OF THE WORKS**				
	The Contractor shall allow for providing the necessary latrines for the labour employed on the works, including labour employed by Sub Contractors, to the satisfaction of the Health and Medical Authorities and for maintaining the same in a thoroughly clean and sanitary condition and paying all conservancy fees. The Contractor shall allow for removing the said latrines and leaving the ground clean and free from pollution upon completion to the satisfaction of the Health and Medical Authorities.				
32	**NO WORKMEN TO BE HOUSED ON SITE**				
	No labour with the exception of a watchman may be housed on the site. The cost of transporting labour to and from the site or elsewhere will be deemed to be included in the tender.				
33	**HOARDING**				
	The Contractor shall allow for providing and clearing away on completion such hoarding, fencing, gates etc. as may be required for the security of the site, and as instructed by the Project Manager to prevent access to the site by the public. The exact location and type of these items are to be agreed with the Project Manager and negotiated with the local Authority by the Contractor who will also be responsible for paying any fees or taxes to the Local Authority in respect of the hoarding, fencing or gates and providing any drawings necessary for approval. The Contractor shall allow for thoroughly maintaining the hoarding and gates throughout the Contract and clearing away and making good disturbed ground on completion. All materials arising will remain the property of the Contractor and he should allow credit against this accordingly.	ITEM			
34	**TRADE NAMES**				
	Where trade names or manufacturers' catalogue numbers are mentioned in these Bills of Quantities, the reference is intended as a guide to the type of article or quality of materials required. The Contractor may use any article or material equal in type or quality to those herein described subject to the prior approval of the Project Manager and at his absolute discretion. The onus of proof as to equivalent quality will rest with the Contractor, whose tender will be deemed to include for the makes described herein.				
35	**REMOVAL OF PLANT, RUBBISH ETC**				
A	The Contractor must allow for removing and clearing away all plant, rubbish and unused materials, and leaving the whole of the site of the works in a clean and tidy state at completion to the satisfaction of the Project Manager. He must also allow for removing all rubbish and dirt from the site as it accumulates during the performance of the Contract.				
	TOTAL OF BILL SHEET 6 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT
	TENDER NO: KAA/OT/MIA/0087/2024-2025

BILL OF QUANTITIES

ITEM No.	D E S C R I P T I O N	UNIT	QTY	RATE (KES)	AMOUNT (KES)
36	**DEDUCTION FROM MONEY DUE TO THE CONTRACTOR**				
	The Project Manager shall be entitled to deduct any monies which the Contractor shall be liable to pay under the Contract to the Employer from any sum which may become payable to the Contractor hereunder and the Project Manager in issuing his Certificates as provided of the Schedule of Conditions shall have regard to any sum so chargeable to the Contractor. Provided always that this provision shall not affect any other remedy by action at law or otherwise to which the Employer may be entitled for the recovery of such monies.				
37	**WORKS TO BE DELIVERED UP CLEAN**	ITEM			
	On completion of the Contract, the site and the works shall be cleared of all plant, scaffolding, rubbish and unused materials and shall be delivered up clean and in perfect condition in every respect to the satisfaction of the Project Manager. Particular attention is to be paid to leaving all windows and floors clean and removing all paint and cement stains.				
38	**APPROVAL OF PROJECT MANAGER FOR EMPLOYMENT OF SUB CONTRACTORS**				
	The Contractor will be required to obtain the approval of the Project Manager in writing before Employing any of his own Sub Contractors for any portion of the work.				
39	**DISPOSAL OF WATER**				
	Allow for keeping the excavations and works free from all water, including spring and running water, by pumping or other means as required.				
40	**SECURITIES**				
	Allow for the provision of Securities				
41	**INSURANCE**				
A	Allow for the provision of Insurance for the works, plant and material				
B	Ditto for Equipment Ditto for other property				
C	Ditto but against accidents or personal injury or death to workmen and third party	ITEM			
42	**OPERATION EXPENSES**				
A	Allow a provisional sum of One Million (Kshs.1,000,000,) for miscellaneous expenses comprising stationery, office consumables including photograph processing and other charges where ere directed by the Project Manager.	ITEM			
B	Allow for Contractor's Profit Allow for Contractor's Overheads	% SUM			
43	**SAMPLES**				
	TOTAL OF BILL OF SHEET 7 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
	BILL OF QUANTITIES				
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
	Note: - The Contractor shall allow for furnishing at his own cost any samples of materials or workmanship that may be called for by the Project Manager for his/her approval and any further samples in the case of rejection until such samples are approved by the project Manager and the project manager may reject any materials or workmanship not in his opinion in accordance with the approved samples. The project manager shall make such tests of the samples or any materials as s/he may at her/his discretion deem desirable, but such tests shall be made at the expense of the Employer and not of the Contractor, unless the result causes the project manager to reject any samples or materials as not being in his opinion in accordance with the specified requirements, in which case the Contractor shall pay for such tests and the cost thereof shall be recovered from the Contractor by the project manager by deduction from the Contract Sum.				
44	**NECESSARY TESTS**				
A	Allow for factory acceptance tests for major equipment at manufacturer's premises at a KES 8,000,000 allow for contractor's profit and overheads at 10% of the value	ITEM			
B	Allow for executing various tests during commissioning and installation stages as per required specifications and engineer's request	ITEM			
C	The Contractor shall allow for all other testing of materials, apart from the above, required by the Appendices of the Bills of Quantities and he shall be responsible for all expenses incurred in completing such tests including costs of materials and labour, equipment, transport and charges of testing authority, etc.	ITEM			
45	**SITE PHOTOGRAPHS**				
	The Contractor shall take and hand over to the project manager at approved intervals site progress photographs in a format to be directed by the project manager .	ITEM			
46	**HOISTING**				
	The Contractor shall allow for all costs related to hoisting his and his Sub Contractor's materials for fixing at any level within the limits shown on the drawings or included in the general description of the works.	ITEM			
47	**SCAFFOLDING**				
	The Contractor shall allow for providing, erecting and dismantling all general scaffolding required for the works. The Contractor must allow here or in his rates for providing all special scaffolding required by his Sub Contractors, other than Nominated Sub Contractors carrying out works for which P.C. Sums are included in these Bills. Where the Contractor is required to provide special scaffolding for these latter Sub Contractors, an item is included for pricing under the relevant P.C. Sum.	ITEM			
	TOTAL OF BILL OF SHEET 8 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
	BILL OF QUANTITIES				
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
48	**CROSSINGS AND TEMPORARY ROADS**				
	The Contractor must allow for providing, forming and maintaining necessary crossings on to the site and temporary roads as may be required by the project manager and removing same at completion and making good damaged or disturbed surfaces as directed by and to the approval of the project manager.	ITEM			
49	**WORK TO BE OPENED UP AT THE REQUEST OF THE ENGINEER**				
	The Contractor shall, at the request of the project manager within such time as the project manager shall name, open for inspection any work covered up, and, should the Contractor refuse or neglect to comply with such request, the project manager may employ workmen other than those employed by the Contractor to open up the same. If the said work has been covered up in contravention of the project manager's instructions, or if, on being opened up, it be found not in accordance with the drawings or Bills of Quantities or the instructions of the project manager, the expenses of opening and covering it up again whether done by the Contractor or by the project manager, shall be borne by and be recoverable from the Contractor or may be deducted from any monies due to the Contractor. If the work has not been covered up in contravention of such instructions and be found in accordance with the said drawings and Bills of Quantities, then the expenses aforesaid shall be borne by the Employer, and be added to the Contract Sum; provided always that, in the case of foundations or of any other urgent work so opened up and requiring immediate attention, the project manager shall, within a reasonable time after the work has been opened, make or cause to be made the inspection thereof, and at the expiration of such time, if such inspection shall not have been made the Contractor may cover up the same and shall not be required to open it up again for inspection except at the expense of the Employer.	ITEM			
50	**Supervision Costs**				
	The Contractor must allow for providing for supervision costs of KES 4,000,000 for inspection teams of KPLC and KAA personnels as directed by and to the approval of the Project Manager.allow for contractor's profit and overheads at 10% of the value	ITEM			
51	**Training of KAA personnel**				
	Capacity building training of at least 6No. electrical engineering staff and 2No. civil to ensure progressive career development and adaptability to the modern technology on standards, contract management, substations and switchgear designs, operation and maintenance etc . The training may be by an institution approved by relevant body at an estimated cost KES 10,000,000. to carter visa, air tickets, tuition fees, accommodation any other relevant training expenses; Allow for contractor's profit and overheads at 10% of the value	ITEM			
	TOTAL OF BILL OF SHEET 9 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
52	**Project Site Office Equipment**				
	Office furniture 3No. Desk with orthopedic sit, file cabinet, safe cabinet, meeting room furniture- 8 no.capacity , Projector, Coloured A3 Printer A3 coloured, stationery , 1No. Desktops 32inch imac M3 and 3No. laptops hp- 2 11th gen icore9 , 64gb ram 1tb storage and 1no. apple M3 as per Engineer's approvals , 3no. Mobile phones- , Office supplies for the contract period 24 months - KES 5M Allow for contractor's profit and overheads at 10% of the valueLaptop computer equipped Windows 10 or latest and provided with a minimum of Pentium IV, 4.3 GHz processor, 1TB hard disk and 64GB RAM, including the MS Office, MS Project, autocad , Adobe Reader and relevant applications software Internet/e-mail access.All-in-One Business Desktop PCIntel® Core™ Ultra 7 155U 4.8 GHz with Intel® Turbo Boost Technology, 12 MB L3 cache, 12 cores, 14 threads)[6,7] Processor,integrated: Intel® Iris® Xᵉ Graphics, 27" IPS widescreen WLED Backlit Anti-glare Touchscreen 16GB DDR5-5600MT/s (2 x 8 GB), 1Year Warranty, including the MS Office, MS Project, , Adobe Reader and relevant applications software Internet/e-mail access.- IP telepohone for control room to link to KAA 's network, UPS Inverter for HMI	ITEM			
	TOTAL OF BILL OF SHEET 10 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
BILL NO.2	**SUBSTATION AND DISTRIBUTION LINE WORKS**				
2.01	2.5MVA, 33/11 kV transformer	pc	2		
2.02	33kV Circuit breaker	pc	6		
2.03	33 kV motorized Isolator with earth switch	pc	2		
2.04	33kV motorized Isolator without earth switch	pc	2		
2.05	33kV Bus bar Voltage Transformers	pc	3		
2.06	33kV Current transformers	pc	3		
2.07	33 &11kV Transformer Bay, 33kV line bay and Bus bar conductor materials	lot	1		
2.08	33kV and 11kV transformer bay, 33kV line bay, Gantries and Steel Support Structures	lot	1		
2.09	33 kV Surge Arresters	pc	8		
2.10	33kV OH line protection and Control panel with BCU	Pc	2		
2.11	Transformer relay panel with AVR relay	pc	2		
2.12	Transformer Bay control panel with a BCU	pc	2		
2.13	11kV Bus bar Voltage Transformers	pc	6		
2.14	11kV Circuit breakers	pc	6		
2.15	11kV Current transformers	pc	3		
2.16	11kV motorized Isolator without Earth switch	pc	2		
2.17	11kV motorized Isolator with Earth switch	pc	2		
2.18	11kV Surge arrestors	pc	6		
2.19	11 kV Neutral isolating link with Neutral CT	pc	2		
2.20	11kV feeder control and Relay panel (2panel for 1 feeders), eachBay shall have one Bay control and protection unit	pc	2		
2.21	11kV lines bay Steel Support Structures	lot	1		
2.22	11kV Lines Bays Bus conductor materials	lot	1		
2.23	Auxiliary transformer 100kVA 33/0.420kV, with HV expulsionfuse, surge arrestors and LV fuse Cut outs protection system	lot	1		
2.24	Common Energy metering panel for 33kV & 11kV Circuits	pc	1		
2.25	3Phase-415V Auxiliary Supply System complete with ACDistribution Board and two source 3-phase Auto change over panel	pc	1		
2.26	110VDC/265Ah and 48VDC/165Ah Battery Changer andBattery bank system	lot	1		
2.27	110VDC and 48V DC supply distribution boards system	lot	1		
2.28	Substation Automation System (SAS)/SCADA equipment	lot	1		
2.29	2.5mm^2 stranded wire armoured flexible multicore copper cables for signal, command and measurement	lot	1		
2.30	MV and LV Earthing system for the substation	lot	1		
2.31	Substation Switchyard Lighting system	lot	1		
	TOTAL OF BILL OF SHEET 11 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
BILL NO.2	**SUBSTATION AND DISTRIBUTION LINE WORKS**				
2.32	Substation Lightning protection system	lot	1		
2.33	Telecommunications (SDH) panel and associated expansionmaterials	lot	1		
B	**11kV Line Materials**				
2.34	3phase 11kV U/G line in 95 mm^2 CU XLPE armoured cable complete with fittings and other necessary accessories	lot/km	1		
2.35	Single mode 48 Cores OPGW, ODF & Splice Boxes	lot/km	1		
C	**Substation Works**				
2.36	Transformer foundation complete with Oil soak pit and Sump	lot	1		
2.37	Control /Switchgear building (minimum floor area of 120m^2) as per Particular specifications on control building complete with Watersupply and harvesting system	lot	1		
2.38	Demarcated Office Building with a floor area of 50 square meter complete with facilities and rain water harvesting system	lot	1		
2.39	Cable trenches (Excavation, Ducts, Trench covers, Cable trays etc.)	lot	1		
2.40	Platform works (Earth work, equipment foundations, Drainage, Weed control, Ballasting etc.)	lot	1		
2.41	Equipment steel Structure and Bays erection, Earthing, substation lighting & lightning protection and associated electromechanical works	lot	1		
2.42	LV and Control cable works, Control & relay panel and associated works.	lot	1		
2.43	Substation equipment installation, Control & Protection testing and commissioning	lot	1		
2.44	Substation perimeter wall, Guard house & Toilet and Access roads in Cabro blocks inside Substation	lot	1		
2.45	Telecommunication and SAS installation (LAN) testing and commissioning	lot	1		
2.46	Substation design works (Electrical, Mechanical, Civil, Automation, Telecom, Control & Protection engineering) and Submission of as built drawing for all civil, electrical, mechanical, automation protection and control systems	lot	1		
2.47	All statutory approval/Supervision fees for substation and Lines	lot	1		
2.48	Site office and communication facilities for KAA / KPLC Project Implementation team	lot	1		
2.49	Control room Office facilities and communication equipment: IP Phone, Printer, UPS Inverter for HMI Workstation, Desk and Chairs)	lot	1		
2.50	civil works for the substation for KPLC metering as per KPLC Engineer's Approvals that include Cable trenches,, control room building, foundations, gate, chain link fence, susbtation surfave made to with aggregate as per approvals the total area 500sqm, access road within the substation	lot	1		
	TOTAL OF BILL OF SHEET 12 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT				
	TENDER NO: KAA/OT/MIA/0087/2024-2025				
BILL OF QUANTITIES					
ITEM No.	**D E S C R I P T I O N**	**UNIT**	**QTY**	**RATE (KES)**	**AMOUNT (KES)**
BILL NO.2	**SUBSTATION AND DISTRIBUTION LINE WORKS**				
D	**33 and 11kV Line Works**				
2.51	11kV Line Overhead and underground Line route Survey and Line design works	Lot/km	0.25		
2.52	11kV Line Civil and structural works	Lot/km	0.25		
2.53	11kV line Construction, testing and commissioning	Lot/km	0.25		
	TOTAL OF BILL OF SHEET 13 CARRIED FORWARD TO SUMMARY SHEET				

PROJECT	**SUPPLY, DELIVERY AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT**
	TENDER NO: KAA/OT/MIA/0087/2024-2025

	SUMMARY SHEET FOR THE BILLS	
	DESCRIPTION	**AMOUNT (KES)**
1	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 1 OF BOQ**	
2	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 2 OF BOQ**	
3	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 3 OF BOQ**	
4	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 4 OF BOQ**	
5	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 5 OF BOQ**	
6	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 6 OF BOQ**	
7	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 7 OF BOQ**	
8	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 8 OF BOQ**	
9	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 9 OF BOQ**	
10	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 10 OF BOQ**	
11	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 11 OF BOQ**	
12	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 12 OF BOQ**	
13	**TOTAL OF BILL CARRIED FORWARD FROM SHEET 13 OF BOQ**	
14	**SUBTOTAL OF THE BILLS**	
15	**10% CONTIGENCY FUND**	
16	**SUBTOTAL**	
17	**16% VAT**	
18	**TOTALS**	

SUPPLY, DELIVERY, AND INSTALLATION 33KV/11KV ELECTRICAL POWER SUBSTATION COMPLETE WITH STRUCTURES AND ASSOCIATED SWITCHGEAR AT MOI INTERNATIONAL AIRPORT

TENDER NO: KAA/OT/MIA/0087/2024-2025

WORKS REQUIREMENTS AND TECHNICAL PARTICULAR SPECIFICATIONS

FEBRUARY 2025

MANAGING DIRECTOR/CEO
KENYA AIRPORTS AUTHORITY
P.O. BOX 19001 - 00501
NAIROBI

GENERAL MANAGER (P&ES)
KENYA AIRPORTS AUTHORITY
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VOL. II

BIDDING DOCUMENT- SECTION VI

FEBRUARY , 2025

GENERAL REQUIREMENTS AND SPECIFICATIONS

FOR

DISTRIBUTION SUBSTATION

& ASSOCIATED LINE

GENERAL SPECIFICATIONS

TABLE OF CONTENT

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 asfollows:

1. Scope of Works
2. Particular Technical specifications
3. Project Specific Design Data
4. General Technical Specifications
5. General Specifications
6. 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 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 extracharge. All equipment shall be complete in all details, whether or not such detailsare mentioned in the Specifications. This includes fixation details and connectionclamps 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 andmaintenance 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 generaland 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 updatedby 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 and, 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, mechanicaldrawings, layout drawings and circuit diagrams shall be compiled on a computer aideddrawing system and as part of the as built documentation be handed over on a CD witha format readable in AutoCAD Version 20 or another format to be agreed upon 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 whereit is considered that these offers 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
- Training of the operator/users
- 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 hisequipment 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 supply five copies of final "as built" documentation taking into account allchanges done under erection and commissioning.

The documents shall be both hard copies and soft copy in external hard disk and CD.

The Contractor shall also deliver manuals for operation and maintenance. These shall at leastcontain 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, circuitdiagram, connection diagram, cable schedules, software documentation etc.
- Operational instruction. These shall illustrate the operational sequences in a clear andconcise way.
- Test and adjustment procedures containing instruction for test and adjustment of theequipment 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 theplant in a safe and optimal way and to perform repairs usual to be done by such personnel. The Project Manager shall approve the manuals and drawings before final submission.

1.6 CONTRACTOR'S QUALITY ASSURANCE PROCEDURES

The Contractor shall have established a quality assurance system based on ISO 9001 also coveringsub-contractors. The Contractor shall provide a documentation of the system with a list of currentprocedures, 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 guarantee data stated in the Bid. The Contractor shallbe 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 shallnot 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 subjectto inspection by the Project Manager before despatch.

If the Employer at any stage in the design and production period finds out that the sub-contractordoes 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 tothe 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 besub-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 areavailable for inspection, at least one month in advance. Factory tests on equipment shall be madeaccording 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 thetype tests the Contractor may submit suitable certificates of tests made on

equipment of the sametype; 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 theSpecifications.

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 sub contractor'sworks.

Measuring apparatus shall be approved by the Project Manager and if required shall be calibratedat 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 theContract. 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 eachwith 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 site 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.

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 workmust 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 Resident 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 beforeEmployer'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 thework during nights or at off-peak time. The Contractor and his personnel must respect the physicalconstraints 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 possiblefor the Contractor and keep a responsible person with switching authority at site during all workinghours (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 hereinor 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 to be 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 theContract 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 inherentin 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 engineersand 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 aswell 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 COVID-19 and HIV/AID.

The Contractor is also responsible for equipping all his workers with necessary safety equipmentas helmets, eye protection glasses and safety belts and enforce the use of such. No toxic material (such as Halon, PCB, and 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 causedby 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 thereinsigned 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 shallarrange 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 berequired for assembly, dismantling adjustments and maintenance of the equipment. The tools shallbe 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.

TABLE OF CONTENT

2.0 GENERAL TECHNICAL SPECIFICATION

2.1 Standards

Ratings, characteristics, tests and test procedures, etc. for the electrical equipment encompassed by this Specification shall comply with the provisions and requirements of the standards of the International Electro-Technical Commission (IEC), unless otherwise expressly stated in ParticularTechnical Specifications. Where the IEC standards do not fully cover all provisions and requirements for the design, construction, testing, etc. and for equipment and components that arenot covered by IEC Recommendations, recognized national standards shall be applied. The rulesof CEE (International Commission for the approval of electrical equipment) and the standards of CENELEC (Comité Europeen de Normalization Elecrotechnique) may also be applied in such cases.

The latest revision or edition in effect at the time of Bid Invitation shall apply. Where references are given to numbers in the old numbering scheme from IEC it shall be taken as to be the equivalent number in the new five-digit number scheme. The Bidder shall specifically state the Precise Standard, complete with identification number, to which the various equipment and materials are manufactured. The Bid Documents do not contain a full list of standards to be used,as they only are referred to where useful for clarification of the text.

2.2 Units

The SI-system (Meter, Newton, Second) shall be used throughout the works covered by this Specification.

2.3 Auxiliary Power Interruptions

The Contractor shall ensure that the plants as a whole will function without interruptions if auxiliary AC power disappears. The plant shall be shut safely down by long interruptions in AC supply or by faults in the DC supply.

2.4 Selectivity

The contractor is responsible for selectivity in the auxiliary AC and DC power system and shall present calculations proving the selectivity between main and sub distributions under maximum and minimum short-circuit levels.

2.5 Design and Materials

2.5.1 General

Design and calculations shall be governed by the design criteria given in the Bid Documents, Standards and normal design practice. Necessary safety factors shall be included. The supplier shall assure himself that the apparatus is suitable for intended use and the environment and stressesto which it will be exposed. He must also assure that the equipment is compatible with equipmentit shall be connected to, or work together with.

The design shall be reliable and simple. The design shall incorporate every reasonable precautionand provision for the safety of the general public as well as for all those engaged in the operation

and maintenance of the equipment itself or equipment connected to or installed in close proximityto it.

All apparatus shall be designed to ensure reliable and safe operation under the atmospheric conditions prevailing at the Site and under such sudden variations of load and voltage as may be met with under working conditions of the system. The plant shall withstand without permanent weakening or deformation from short circuit current within the rating of the apparatus (includingthose due to faulty synchronizing) as well as normal atmospheric over voltages taking into accountthe use of lightning arresters.

Special considerations shall be given to pressure rises by short circuits and fire risk. All material and equipment shall be designed and arranged so that over pressure will be relieved in a safe direction and so that fire risk is minimized and consequences of a fire reduced. The indoor 11kV switchboard shall be designed with a duct on top of the board for pressure release.

All plastic material used in boxes, panels and boards shall be halogen free and self-extinguishable.

The contract supplies shall be designed to facilitate inspection, cleaning and repairs and for operation, in which continuity of service is the first consideration.

All conductors and current carrying parts must be dimensioned with ample cross sections so that temperatures are kept within limits in operation and under short circuits. Temperature rises on all equipment shall be kept within limits set in IEC standards provided nothing else is specified. Forall current carrying parts the permissible short circuit duration shall be at least 1 second. All electrical connections shall be secured by bolts or set screws of ample size, fitted with locknuts orlock washers of approved types.

The equipment shall as far as possible be factory mounted with internal cables and internal equipment installed before shipment. Plug-in components can be shipped separately.

Equipment for use outdoors or in wet or damp rooms shall be constructed so that water runs off. It shall also have devices draining any inside condensation that may form. Axial bearings on suchequipment must be equipped with durable sealing preventing water to ingress.

2.5.2 Electrical Equipment Materials

All materials supplied under this Contract shall be new and of the best quality and of the class most suitable for working under the conditions specified. They shall withstand the variations of temperature and atmospheric conditions arising under working conditions (including start and stop) without distortion deterioration or undue stresses in any parts and also without affecting thesuitability of the various parts of the Works for which they were designed. The Plant shall be designed for a lifetime of 40 years. Equipment with a shorter life cycle shall be identified and so arranged that they are easy to replace.

No welding, filling or plugging of defective parts will be permitted without the sanction in writingof the Project Manager/Engineer.

Materials that are susceptible to mould growth under tropical conditions shall be treated

to excludemoisture and prevent growth of mould after all machining has been carried out.

Copper and aluminium used as electrical conductors shall be of the electrolytic type and comply with the respective ASTM or DIN Standards.

Cast iron shall not be used for chambers of oil-filled apparatus or for any part of the equipment that is in tension or subject to impact stresses. Exception is made where it can be shown that service experience has been satisfactory with the grade of cast iron and the duty proposed.

2.5.3 Bolts, Studs, Nuts, Screws, Washers, etc.

All bolts, studs, nuts, etc., shall have a standard metric threading and conform to the relevant standards as regards shape and tolerance. They shall be of Strength Class 8.8 and marked accordingly.

All bolts, studs, nuts, washers, screws, etc., used outdoor or in wet or moist environment shall bein stainless steel or hot-dip galvanised. If hot-dip galvanised bolts and nuts are used, special considerations shall be taken related to pre-stressing. Bolts, nuts, studs and screws that require frequent tightening and unbolting during inspection or maintenance procedures, shall be of stainless steel.

All bolts and nuts shall be hexagonal, either normally or of the round head socket type and securedin an approved manner against becoming loose during operation.

The Contractor shall supply the net quantities plus 5% of all permanent bolts, screws and other similar items and materials required for installation of the works at the site. Any such rivets, bolts,screws, etc. which are surplus after the installation of the equipment has been completed shall become spare parts and shall be wrapped, marked and handed over to the Employer.

Taper pins shall have threaded stems with nuts where dismantling of the pins is likely to be required.

Bolts shall not protrude more than 10 mm beyond the nut but not less than two full threads.

2.5.4 Panels and Support Structure for Electrical Equipment

Panel boards, cubicles, cabinets, etc. in dry rooms shall have interior surfaces painted with at leastone priming and one finishing coat of anti-corrosion paint. Exterior surfaces shall be adequately treated to be substantially corrosion resistant, with one priming coat, and two finishing coats. Alternately both inner and outer surface shall be powder coated.

Outdoor installations and indoor installations in wet and damp rooms shall at least have one priming coat and two layers of paint on zinc powder basis applied after perfect cleaning.

Structural supports outdoor and in wet or moist rooms and parts that cannot be readily painted, shall be at least 80micron hot-dip zinc galvanised. All galvanizing shall be in accordance with BS729 or other internationally approved standards. Steel below ground shall in addition to galvanizing be protected with Bitumen or a substance of similar quality.

The particulars of priming and finishing paintings shall be stated in the Bid, with

specifications ofpaint, together with a listing of colours available, for each of the plant and equipment.

The Employer is not bound to accept the finishing colour proposed by the Bidder. Determinationof colour shall be at the option of the Employer and shall be finalized at the time of approval of drawings.

2.5.5 Insulating Oil

All electrical equipment requiring insulating oil or other insulating liquids shall be furnished withthe first filling including flushing, if required. An excess of 10% of the net amount of oil or liquidrequired for each component shall also be furnished by the Contractor as spare.

The Contractor shall endeavour to employ, as far as practicable, one type and make of insulating oil only for all the electrical equipment.

2.5.6 Sulphur hexafluoride gas (SF_6)

The SF_6 gas shall comply with the requirements of IEC 60376. In addition to the quantity of gas required to fill the equipment supplied, 20% shall be supplied as spare.

The high-pressure cylinders for shipment and storage of the SF_6 gas shall comply with the applicable national regulations. All the necessary pipes, couplings, flexible tubes and valves for coupling to the switchgear for filling or evacuating all the gases to be used, with all necessary instructions for the storage of this equipment, shall be provided.

2.5.7 Locking Devices and Padlocks

Facilities for applying safety or security padlocks to circuit breaker operating mechanisms, disconnector and switch operating handles, control switches, control cubicles, outdoor cabinets etc. shall be provided for all equipment accessible by unauthorized personnel. The facilities shallbe suitable for padlocks having a hasp diameter of 10 mm. Padlocks are not required.

2.5.8 Nameplates and signs

Marking shall be in corrosion resistant material with permanent lettering. All equipment shall be marked in accordance with standards and local practice. The Contractor must mark all componentsin a clear and unambiguous way so that it can be related to the documentation. All operating mechanisms as pushbuttons, switches and handles must be marked in a precise way and necessarywarning signs must be supplied.

All outdoor nameplates and signs shall be made of non-corrosive weatherproof material such as traffolyte, aluminium or stainless steel.

Letters shall be white and engraved on black background. For aluminium and steel signs black letters on metallic background shall be used. For warning signs red background shall be used.

2.5.9 Tool Rack in the Switchgear Room

A tool rack shall be installed in the switchgear room for all the, handles and tools required for operation of the switchgear including panel/marshalling boxes keys. The rack shall be easily accessible to operators and not cause obstruction to operations.

2.6 Equipment

2.6.1 Standardization

The Contractor shall be responsible for the standardization of all small mechanical and electrical equipment, materials and devices for the Works. He shall arrange and perform the necessary co- ordination work with his subcontractors for the purpose of such standardization. Such equipment,devices, fittings, etc. shall comprise, but not necessarily be restricted to, the following:

- Programmable controllers, control devices and control switches
- Electrical instruments and meters
- Terminals and terminal blocks
- Primary, secondary and auxiliary relaying devices
- Contactors, fuses, miniature breakers and the like.
- Lamps, bulbs, sockets, plugs, etc.
- Lubricants
- Oil

2.6.2 Electrical Sockets

Single phase electrical sockets installed for lamps, hand tools, measuring equipment etc., shall besquare pin type with earth connection. The sockets shall be rated for at least 16A (lower rating shall not be used). Other sockets shall be according IEC 60309 (CEE type). The Contractor shall endeavour to use components available in the local market.

2.6.3 Degree of Protection

Enclosures for electrical equipment shall have the following degree of protection (ref IEC 60034,IEC 60059, IEC 60529 and IEC 60947):

- Motors/Motor Terminal boxes IP 54/IP 65
- Dry Transformers IP 2x
- Limit switches IP 65
- Indoor switches IP 5x
- Outdoor switches IP 54
- Medium voltage enclosed switchgear IP 42 (IP 20 with front door open)
- Low voltage switchgear and control cabinets:
- Indoor IP 3x
- Outdoor IP 54
- With open door IP 20
- Junction boxes IP 65
- Light fittings
- Outdoor and wet areas IP 4x
- Indoor IP 2x

2.6.4 Indicators and Instruments

All status and position indication LEDs shall be of the light emitting diode type and be replaceablewithout use of soldering or special tools. In un-manned operation a switch shall be arranged for turning off the indication lights for the substation. A switch for lamp test shall be arranged.

All indicators mounted on control desks and panels shall be flush mounted.

The minimum accuracy tolerance for these indicators shall be 2.5% of span. Indicators shall generally be of the moving coil type but electronic type digital indicators are also acceptable. Where digital indicators are used these shall be provided with at least 4-digit indications.
Indicators mounted on local gauge boards shall be of circular type and shall have a minimum casediameter of 160 mm. All local indicators shall be housed in robust dust and moisture proof cases suitable for open air installation. The read-out window for indicators, recorders and similar equipment shall be non-reflecting, anti-static and minimize parallax errors.
All control instruments shall be rectangular or square type, with the exposed metal portions of allcases having the same finish, trim and general appearance. Instrument and meter scales shall be white with black markings. Instrument cases shall be dust- proof.
Each instrument shall have a zero-adjustment device so that the zero position of the pointer can be adjusted without removing the cover. For frequency measurement purposes it is not permissible to use reed type frequency meters except for the synchronizing equipment.

2.6.5 Electronic equipment

Where possible, plug-in type printed circuit boards shall be used.

External connections to the boards shall be by plug and socket connection.

All electronic components, including integrated circuits, transistors, resistors, capacitors and inductors shall be selected in order to ensure long life and stable operation. Indication lamps usedin conjunction with electronic circuits shall be light emitting diodes.
All relay equipment shall use modern plug-in type circuit boards, containing standard type miniature relays, which can be plugged- in and easily replaced on sockets on the circuit boards. Only a few types of standard relays shall be used. All relays shall be of the encapsulated type. External connections to the boards shall be by plug and socket connection.
For time relays transistorized relays shall be used. Time-settings shall be effected by means of setting knobs on the front panel.

2.7 Measurement of Electrical Parameters

Remote indicators for electrical quantities such as power, voltage, current frequency, etc. will be of the milliamp type. The overall dimension of the ammeter, voltmeter, shall be 96x96mm. All power and energy measurement devices shall be digital type.
All indication contacts shall be galvanic isolated and potential free.
Temperature indicators shall be of the PT100 type protected to suit the environment where it is tobe used. Pressure indicators shall be of corrosion proof material, IP 54, vibration class 1. The scaleshall indicate bar or equivalent m water column. The diameter shall be 160 mm and the measuringpipe shall be equipped with stop chock. If the indicator is exposed to vibration, it shall be filled with damping liquid (glycerine).

Limit switches for pressure, temperature and flow (even if combined with the indicators) shall beof class 1 without noticeable hysteresis. Where more than one limit is required, each limit shall beindependently settable. Set points shall be easily readable.

Flow meters shall be graded in litres/s from zero to well above required value. Flow meters for water shall be electronic without moving mechanical parts.

Panel instrument shall be accuracy class 1.5 or better, dimensions 96x96 mm with non-

reflectiveglass. Measuring converters shall be of accuracy class 0.5 with 4-20 mA output, DC auxiliary voltage and galvanic isolated potential free output. All semaphores shall be of LED type, and shallbe used for issuing of commands (Trip and Open). No additional push button for close and open shall be installed.

2.7.1 Fuses and Miniature Circuit Breakers

Miniature circuit breakers (MBCs) shall replace fuses in control and power circuits 100 Amps andbelow. They shall be approved as circuit breakers and have a breaking capacity sufficient to breakthe short circuit at the place of use (i.e. no upstream backup fuses for reduction of fault level shallbe necessary). All circuit breakers used in DC circuits must be approved for the relevant DC voltageand current.

Where nothing else is specified, LV power fuses above 100Amps shall be of high rupturing capacity cartridge, type NH GL, according to DIN VDE 0636 and IEC 60269. All fuse bases shallhave a load switching capacity and a thermal rating equal to the rating of the largest fuse it can accommodate. Fuse replacement shall be possible without use of special tools and with IP 20 protection against live parts.

2.7.2 Relays and Contactors

All resetting of relays and contactors must be possible without dismantling or removal of top or anycovers and without risk for electrical shock. All contactors and relays used in DC circuits must beapproved for the relevant DC voltage and current.

Limit switches not mounted in enclosures shall be of the proximity type without need for separatepower supply and equipped with light emitting diodes to indicate position.

2.7.3 Motors

2.7.3.1 General

As far as possible and if nothing else is specified, motors shall be three phase squirrel cage motorscomplying with IEC 60034 and with dimensions according to IEC 60072. Such motors shall havethe following data:

Continuous rating	130 % of mechanical load
Frequency band for continuous rated operation without exceeding temperature class	47 – 57 Hz
Voltage band for continuous rated operation without exceeding temperature class	-15 % - +10 %
Maximum start current with direct start	
Motors above 75 kW	5 x In
Motors between 35 and 75 kW	6x In
Insulation class	F
Temperature rise	B
Direct starting range	75 – 110 % of Un

Motors shall have sealed ball or roller bearings. If the bearing is not sealed for life it shall withstandtwo years of operation before refill of lubricants.

Outdoor motors and motors erected in moist environment shall be equipped with still-stand heaters controlled from the starter. The heater shall be so dimensioned that

maximum temperature is not reached even if the heater remains connected under operation.

Motors shall withstand three consequent starts without overheating. Motors over 20 kW shall be equipped with thermistor-based temperature protection.

The three-line connections of A.C. motors shall be brought out to a terminal box sealed from the motor. The terminal arrangement shall be suitable for the reception of aluminium and copper cable. A permanently attached diagram or instruction sheet shall be provided giving the connections for the required direction of rotation. If only one direction of rotation is permitted, this shall be clearly marked.
Motors to be connected to variable speed drives shall be special adapted to this.

2.7.3.2 Special Motors

Other types of motors shall only be used where squirrel cage motors are inconvenient to use (andthen only after approval by the project manager) or if DC motors are specified. Such motors shall as far as possible, follow the requirements set above.

Brushes shall be designed with a constant brush pressure and shall withstand at least 5 000 hoursof operation before they have to be replaced. It shall always be at least two brushes in parallel andthe brush-holders shall not touch the commutators when the brushes wear out. The press fingers shall not carry the current and each brush shall be separately adjustable.

Where single phase motors are used the motors shall be grouped so as to form, approximately, a balanced three phase load.

2.7.4 Motor control gear

Control gear shall comply with the requirements of IEC 60947, the control gear being rated according to the duty imposed by the particular application. No replacement of equipment shall be necessary after short circuit (ref. IEC 60947)

Motor contactors shall comply with IEC 60947 class of intermittent duty 0-3 and utilisation category AC4. The contactors, and their associated apparatus shall be capable of switching the stalled current, and shall have a continuous current rating of at least 50% greater than the full loadcurrent of the motors they control.

The operating currents of overload trips fitted to motor contactors shall be substantially independent of ambient temperature conditions, including the effect of direct sunlight on the enclosure in which the contactors are installed.

Where small motors are connected in groups, the group protection shall be arranged so that it will operate satisfactorily in the event of a fault occurring on a single motor.
Each motor or group of motors shall be provided with control gear for starting and stopping by hand and automatically. Overload and single-phasing protection shall be provided. Facilities for padlocking the supply in off position shall be provided.

2.7.5 Computer Based Controllers

Computer Based Controllers inclusive Programmable Logical Controllers (PLC) can be used for individual control functions. Such equipment shall be designed for industrial environment and application in high voltage plants. The control equipment must be fed

from the general station DCsupply.

The control equipment must be equipped with internal "watchdog" function giving external potential free alarm by internal fault. The operational status shall be frozen by fault or un-normalfunction so it can be re-established after restart. The process must be shut down to a safe stage if fatale faults occur in the controller.

Analogue and digital in and out puts must be galvanic isolated and potential free and must, together with the enclosure, screen against disturbance from electromagnetic field occurring by short- circuit, switching over voltages or lightning discharges. The control equipment shall be tested according IEC 60255 and fulfil relevant EMC requirements for Industrial Environment.

Digital in- and outputs shall be tested and approved for switching of DC voltages supplied by the main plant battery (AC values are irrelevant).

Programme shall be stored in "flash ram" or similar storage medium and shall not be destroyed orchanged by power failure (i.e. Separate backup battery shall not be used). The memory shall contain the last program version.

All programming of control sequences shall be documented in a self-explanatory way not requiring special program knowledge for understanding (function block programming or similar)

Communication between various controllers (and the main control system) can be over Fibre optical cable provided agreement between the contractors. Such communication must use open protocols to be approved by the Project Manager. The Bidder shall in any case present a verification of transmission quality.

The Controllers shall be delivered with software and software licenses needed for testing, settingand reconfiguration. If hardware other than laptop is required for this such shall be included in the supply.

2.8 Construction and Erection

2.8.1 Switchboards, Panels and Cabinets

Switchboards, control, panel boards and cabinets where required shall be of robust construction, formed of a steel frame and covered with smooth steel plate. All outdoor cabinets/Cubicles shall be of powder coated CRCA mild steel grade. The steel plates shall be properly stiffened to prevent distortion. Panels for protection shall be modular in design with two doors; an Inner rack hinged frame Swing door and a front glazed transparent acrylic Perspex/glass door. The frames of the boards shall be designed to permit firm anchoring on the floor. The frames shall permit easy erection, and allowance shall be made for extension of the board by similar additional panels. Panels for power circuits shall be in accordance IEC 61439 (minimum partly type tested apparatus(PTTA)). All enclosures shall be ventilated so that the temperature inside the enclosure do not raise more than 5°C above ambient even with possible heaters connected.

All control and Protection panels shall be of modular design, using a transparent high grade Perspex acrylic material as front door.

Outdoor-cabinets and cabinets for moist environments shall be provided with

thermostat-controlled heaters to inhibit collection of moisture. The heater must be arranged not to overheat any cables or equipment. Openings for drainage of condense shall be provided at the lowest point in the cabinets.

All major or important compartments containing electrical equipment shall be provided with a single phase 16A square pin socket and internal lighting facilities switched off by a door switch.

Unless otherwise specified or agreed upon, all instruments, apparatus and devices on the panel fronts shall be provided for flush mounting.
The minimum size for indicators mounted on the various sections of the panels shall be:

- non-urgent indicators 96 x 96 mm
- important indicators 144 x 144 mm
- mimic diagrams 48 x 48 mm

Flush mounted relays shall be provided with transparent cover. The cover shall be hinged to allowresetting and adjustment. All terminals and all equipment shall be accessible without dismantlingother components. Equipment shall not be mounted in swing-out doors. However, proper swing out frames may be used provided they can be opened will full load without twisting or distorting the panel. Windows shall be provided in front of rack mounted equipment.

2.8.2 Wiring and Terminal Blocks within Enclosures

All internal panel wiring shall use 1.5mm^2 stranded flexible copper conductor with a PVC insulation suitable for operation at voltages below 1000V and in compliance with the provisions of the applicable IEC recommendations. Cables interconnecting the control /protection panels andequipment from switchyard shall be multicore, each core stranded (7/0.29) and not smaller than 2.5mm² for Control, and protection circuits, and 1.5mm² for telecommunication circuits. All control and protection multicore cables shall be steel wire armoured. Whereas telecommunicationcables shall be steel wire or copper tape armoured.

For wiring within boards, the "bunch" pattern shall be adopted. For a small number of connections,wiring may be grouped using flexible plastic bands or equivalent. For a large number ofconnections, a system using support strips or U-shaped troughs (with covers) shall be used. Ample space shall be provided for running of cable within the enclosures.

The screens or screened pairs of multicore cables shall be earthed in accordance with a coherent Earthing philosophy to be worked out by the main Contractor and approved by the Project Manager. The screen and earth wires shall be terminated in terminals dedicated for this use. All free conductors in connecting cables shall be terminated in terminals that shall be temporarily connected to earth and special marked. Though, in field boxes the free conductors can be laid orderly and short-circuited or insulated. The length shall allow future connection.

Multi-stranded conductor ends shall be fitted with a suitable crimped thimble (bootlace ferrule type). The thimble shall be of correct type and length according to the core size and crimple toolsshall be specially adapted to the thimble and cross section used. Each wire shall be separately terminated unless otherwise approved.

It shall be possible to work on small wiring for maintenance or test purposes without

making a switchboard dead.

The wiring identification shall be by numbered ferrules, sleeves or other approved means.

All wiring shall terminate at terminal blocks, the latter shall be of the moulded type not less than IP20 and provided with barriers to separate power from control cables. It shall be possible to replace a single terminal block without dismantling a whole row. They shall be clearly marked, the designations being those entered in the respective wiring diagrams. Terminal blocks using screws acting directly on the wire (conductor) as well as spring type terminal blocks are not acceptable. To avoid squeezing of the wire the screw pressure shall be applied by a pressure platehaving smooth edges. 'OBA' terminal blocks are not acceptable. Only terminal blocks that are operated using screw drivers are acceptable.

Terminal blocks for current and voltage transformers shall be separated and specially marked. They shall be equipped with a sliding splice for separation and "banana" sockets on both sides fortesting. The splices shall be so arranger that they fall into closed position when loose. Where appropriate, other terminal blocks shall be equipped with facilities for testing, such as short- circuiting, separating splices, plugs, etc. All such device shall be accessible even when parallelingstrips are used.

Only one conductor shall be connected to each side of a terminal block and the branch-offs shall be made by interconnecting the necessary number of neighbouring blocks by means of copper strips.

Terminal blocks shall be located at least 300mm from the bottom of the panel and shall be easilyaccessible. Terminal blocks for different voltages shall not be mixed between one another. All conductors in a multi-core cable shall be terminated on the same terminal block. The blocks shallbe grouped for each voltage and they shall be clearly marked for easy identification of the system voltage. There shall be at least 20 % spare terminals on each block.

2.8.3 Cable Laying and Routing

The final routing of HV and LV cables in indoor and outdoor installations shall be determined bythe Contractor from the directives given in Particular Specifications, and the principles shown in the layouts on the drawings. All cable routing and arrangement shall be subject to the Project Manager's approval and must adapt to obstacles as tubes and ventilation channels. All penetrationsof fire zone separations shall have the same fire classification as the separation itself.

Cables shall be laid on corrosion resistant (aluminium or hot dipped zinc galvanised) perforated cable trays and racks and by raising cables fixed to cable ladders. The trays shall be dimensionedand fixed so that it allows one man to climb on it in addition to the cable load. Each tray shall haveat least 15 % spare capacity. The distance between each tray shall at least be 300 mm. For exposed outdoor installations cables shall be laid in covered cable trenches, plastic or steel ducts, dependingon the available space.

Branch offs to individual equipment shall be fixed and supported all the way to the connection box. Cables and cable supports shall be properly fixed and secured against movement under short-circuit and strain caused by erection work. Particular attention shall be given to termination in confined areas where personnel may climb under erection

and maintenance. Flexible tubes of "spiral type" shall not be used whereas tubes of "plica" type can.

Low power cables such as cables for control, metering, etc. shall not be run in close parallel to high power cables or earth wires, but shall be run at the greatest possible separating distance. The minimum distances are:

- High and medium voltage versus control and measuring cables 800 mm
- Low voltage power cables versus control and measuring cables400mm

Necessary EMC consideration shall be taken in accordance with EMC standards.
Additionally, cables for extra low power, i.e. mA and mV circuits and cables connected to low power solid state electronic circuits, shall be laid in separate sheet steel trays with covers. The DCtrip and AC voltage supplies and wiring to main protective gear shall be segregated from those forback-up protection to the greatest extent possible.

Single-phase power cables shall be run in trefoil configuration, single-phase DC power cables shall be run in parallel. Special care shall be taken so that closed magnetic circuits do not form around single-phase cables.

Cables below 35mm^2 cross section shall be copper. Larger cross sections may be aluminium. Minimum nominal cross sections for cables shall be as follows:

- All Measuring cables for current — 4 mm^2 steel wire armoured and flexible
- Control and other measuring cables — 2.5 mm^2 steel wire armoured and flexible
- DC supply circuits — 2.5 mm^2 steel wire armoured and flexible
- Telecommunication — 1.5mm^2 Steel/tape armoured and flexible
- Power cables — according 120 % max load current

All cross section must be checked against max load current, allowable burden on measuring transformers, short circuit values, voltage drop, protection requirements and selectivity.
The cables shall be marked with item designation in both ends as well as by entrances in enclosures. The cable marking shall be fire proof.
Cables shall be laid in full runs and <u>not</u> spliced unless approved by Project Manager. Terminationof multi-stranded conductor ends shall be with a suitable crimped thimble as specified above. Allother cable lugs or similar shall be of crimped type adapted to the cable type and cross-section used. The tools used should be special approved for the lugs and cable type used.

The cable supplier's instructions regarding handling and bending radius shall be followed.

Fibre optic cables shall not contain metallic material and be so laid that they have proper mechanical protection. I.e. cables not constructed for embedding shall be laid in protective tubes.

2.8.4 Earthing (Grounding)

An embedded Earthing system shall be designed and supplied by the contractor. The embedded Earthing system shall be arranged, connected to expose and accessible Earthing bars. From here an exposed Earthing system shall be arranged. The Contractor

is responsible for installation and connecting of his equipment to this network so that all precautions are taken regarding safety (ref. National regulations) and shielding against disturbances. Cables shall be earthed and shielded in accordance with earthing philosophy worked out by main switchgear contractors. For details of the Earthing system refer to specifications on earthing system. The main grid and risers earthing conductor shall use bare earthing copper of not less than 95mm^2

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3. PROJECT SPECIFIC DATA

3.1 Definitions

Whenever the following terms or words are found in the specifications and/or other documents, they shall have the following meaning:

"High Voltage Equipment" (HV):
Mostly used for equipment provided for a maximum operating voltage higher than 52.5 kV (generically also used for voltages down to 1000 V).

"Medium Voltage Equipment" (MV):
Equipment provided for a maximum operating voltage higher than 1000 V and up to 52.5 kV.

"Low Voltage Equipment" (LV):
Equipment provided for operation at 1000 V or below. (For transformers the term Low Voltage Winding is used for the side with lowest rated voltage regardless value)

AC means Alternating Current, DC means Direct Current, where protection degree IP xx is mentioned, it shall generally be according to IEC 60529 "Degree of Protection Provided by Enclosure".

3.1.1 Design Data, High and Medium Voltage

The rating and design criteria for the HV and MV plant and equipment shall be as follows:

Item	Parameters	System Voltage	
		33kV	**11 kV**
1	System	50 Hz, 3Phase	
2	Neutral point Earthing	Solid earthed	
3	Nominal voltage of networks	33 kV	11 kV
4	Highest system voltage as defined by IEC-60038	36 kV	12 kV
5	Short circuit and earth fault current, symmetrical r.m.s. value (min breaking current) not less than	25kA	25 kA
6	Short time withstand current (3 Secs.)	25kA	25kA
7	Dynamic peak current (min making current) not less than	63kA	63 kA
8	Rated current of bus bars and bus coupler if not given in Scope of Works, for each individual substation	1250A	1250 A
9	Minimum rated current of isolating switches and circuit breakers if not given in Scope of Works	800A	630 A
10	Insulation level according IEC 60071:		
10a	Phase-to-earth	N/A	N/A
	Longitudinal impulse component of combined test	N/A	N/A
10b	Lightning impulse withstand voltage (1.2/50 m/s KV_{Peak})	170kV	75 kV
10c	Power frequency withstand Voltage (1min dry and wet to earth and between phases (kVrms)	70kV	28 kV
11	Minimum Clearances for Switchyard Works		
11a	Phase to earth [mm]	500	500
11b	Phase to phase [mm]	435	250
11c	Bus bars phase to phase [mm]	-	1250
11d	Height to live parts above ground [mm]	2900	2900
11e	Height to live parts above ground at transformer transport routes [mm]	5000	
11f	Lowest part of insulators above ground [mm]	2500	
12	Maximum temperature rise of conductors above ambient temperature (40 °C)	40 °C	
13	Maximum wind pressure on conductors and cylindrical objects	400 N/m^2	
14	Maximum wind pressure on flat surfaces	820N/m^2	
15	Minimum nominal creepage distance as defined in IEC60815, Table II	25mm/kV (industrial area)	

Note (1)
Ref IEC 60038
Note (2)
For all current carrying parts the permissible short circuit duration shall be at least 3 seconds. Indoor equipment shall be arch tested in accordance with IEC 60298 amendment 2. The dynamic or momentary short circuit current on which the equipment design shall be based; shall be computed by multiplying the r.m.s. value of the symmetrical short circuit current by the factor

$1.8 \times \sqrt{2}$

Note (3)
Ref IEC 60071)
All High and Medium Voltage equipment shall be designed for installation at 70m above sea level. IEC60071 shall apply with the specified correction factor for the altitude above sea level.

3.1.2 Design Data, Low Voltage Equipment

Low voltage installation shall be in accordance with EMC directives. The rating and design criteriafor low voltage equipment shall be as follows:

AC Voltage	**Parameter**
Nominal system voltage	415/230 V -15%, +10% (+ or – 6%), TN - CS
System frequency	50 Hz (±2%)
DC System	110V and 48V (for telecommunication)
Power frequency test Voltage 1min	2.5 kV
Thermal rating of conductors	120 % of load
Maximum short-circuit Current	25 kA

AC LV equipment can, after the Project Manager's approval, be rated for lower short-circuit current if calculation demonstrates that lower values are applicable at the place of installation. DCequipment shall be adapted to the actual values at sites as shown in calculations.

The operating Voltage for telecommunication equipment shall be 48Vdc.

3.1.3 Phase relationship

The phase relations and designations shall be in accordance with the existing system of the Employer. The phase sequences will be made known to the Contractor at a later date, but not laterthan 1 month from date of commencement. The standard phase colours are Red, Yellow, Blue (RYB).

3.1.4 Colour Coding

All wires must have ferrules at all terminations to distinguish each signal. In addition, the wires shall have the following colours:

Circuit	**Colour of Wire**
Voltage transformers	Red
Current transformers	Black
A.C. Circuit	Yellow
D.C. Circuit	Blue
Grounding circuit	Green with yellow stripe

(Following coloured ferrules shall be provided on each wire in order to identify phase and polarity.

Phase and Polarity		**Colour of ferrules**
A.C.	First phase	Red
	Second phase	Yellow
	Third phase	Blue
	Neutral	Black
	Grounded	Green with yellow stripe
DC Supply	Positive	Red
	Negative	Black

Ferruling system should be submitted to the Employer for approval before commencement of works.

3.1.5 Environment

Unless otherwise specifically stated in Particular Technical Specifications or Scope of Works, anyequipment, component and assembly shall be designed for the following service conditions:

Parameter	Max	Min
Ambient air temperature		
Outdoor	+50°C	-1°C
Indoor	+50°C	-1°C
24 hour average maximum	+40°C	-1°C
Ambient temperature for cables in the ground	+50 °C	-1°C
Relative humidity	90-94%	
Height above sea level	60m	50m
Cooling water temperature	N/A	N/A
EMC Class (IEC 61000)	Industrial environments	
Seismic coefficient	0.15	
Wind pressure on project area of conductors and cylindrical objects	430 N/m²	383N/m²
Maximum wind pressure on steel members on 1.5 times projected area	820 N/m²	
Rainfall conditions		
Average	800-1700 mm/year	
Maximum	160mm in 24 hrs.	
Annual mean isokeraunic level	Max 180 thunderstorm days	
Pollution (IEC 60815)	Heavy : class II	

Wherever any of these maximum or 24hour average temperatures exceed the normal service condition temperatures of the IEC Recommendations for the relevant equipment, or of such otherstandard which is approved to be applied, the permissible temperature rises of the IEC Recommendations or the standard shall be reduced by the same amount as the difference between the above figures and the normal service condition temperatures. The Contractor shall guarantee these reduced temperature rises.

All air-cooled equipment shall be cooled with convection (i.e. without fans) provided other coolingmethods are not explicitly allowed for in the specifications.

3.1.6 Noise

The equipment shall as far as possible not generate undue vibrations or bothersome noise. Provided nothing else is specified the following requirements shall not be exceeded:

- Machine hall, workshop etc. (one meter from the machine) max 85 dB(A)
- Office, control room, day room etc. max 55 dB(A)
- Emergency diesel generator (7 meter from engine room) max 85 dB(A)

3.1.7 Auxiliary Power

3.1.7.1 Electric Service during Construction

The contractor shall ensure the availability of metered electric supply at 415/230V, 3-phase, 50 Hz TN-S at the substation sites. All tools and equipment supplied by the Contractor shall be suitable for this supply system.

3.1.7.2 Power Supply

On HV substations the power for the auxiliary service is in general supplied from the station transformers connected to the tertiary windings of the transformers whereas on MV substations the, power is supplied from station transformers connected to the MV busbars. The system is shown in detail on the single-line diagrams enclosed in the drawing section and further specified in Scope of Work. Less important MV substations may take the auxiliary voltage from the general surrounding grid. Equipment needing uninterruptable supply shall be fed from permanently charged station batteries. If other voltage sources or voltage levels are required, they shall be included in the Bid. Such voltages shall not be brought out of the cabinet where they are used.

All the substations that have more than one source shall have an automatic change-over scheme for the two 415Vac power supply sources at the substations

3.1.8 AC Auxiliary Supply

Components in the AC low voltage main distribution system shall have a voltage rating of 415/240volts, 50 Hz. The system shall be 3-phase-4wire, with the transformer neutral grounded (TN-CS)

For lighting, small power socket outlets, domestic appliances and other small power, 230V shall be used. 16 A sockets shall be of the British Standard type with square pins.

3.1.9 DC Auxiliary Supply

The DC auxiliary supply shall be (unless otherwise stated in Scope of Works):

- For control, protection and alarm circuits shall be 110V-IT
- All bulbs and any voltage sensitive relays shall be rated 125/52Vdc.

3.1.10 Un-interrupted supply (UPS)

DC/AC UPS shall supply dedicated computer and measuring equipment. The supply shall be 230V-IT.

3.1.11 Operation and Control

The operations, control procedures, monitoring and protective devices for the plants are describedin Particular Technical Specifications.

The Contractor shall take all measures and furnish all requirements necessary for effecting the intended method of operation and control.

The station functional control shall be possible in a hierarchic structure as follows:

- Supervisory Control from a Supervisory Control and Data Acquisition (SCADA) System. All voltage levels will be connected to Regional Control Centres (RCCs) in Nairobi. All equipment and stations to be refurbished under this project shall be prepared for normal day-to-day operation from these

centres. The RCCs are subordinated to the National Control Centre (NCC). The station HV and LV switchgearshall be controlled from RCC. Indications shall be available both in NCC and RCC.

- Local Control from the local relay and protection panels and from the instrument sections on MV switchboards. If these contains full mimic and display functions the remote control can be omitted in MV panels.
- Direct Control/Emergency Control from the apparatus itself.

The stations shall function without interruptions even if connection to higher levels fails. A local/remote switch shall be accommodated on each control position blocking remote operation but not indication. The position of this switch shall be indicated in the higher levels of operation.

The control shall include operation of all circuit breakers and motorized disconnectors. Status indication shall be available in the supervisory system for all HV and MV breakers in the systemas well as Bus bar voltages, line and transformer load in Ampere (plus MW and MVAr). For on- load tap changers position indication and raising/lowering of the tap changer position shall be possible supervisory and remotely. MV transformers may be equipped with automatic voltage control functions and manual override shall then only be possible if the automatic function is blocked locally. Relay trips and other relevant alarms shall also be transferred.

Direct control of all station switchgear at the respective switchyards/panels shall be possible.

Interlocking devices and automatic change-over systems shall be incorporated in the control circuits in the quantity needed to guarantee non-interruption and correct sequence of operation of the equipment. Protective devices shall be supplied in accordance with the Particular Technical Specifications, and the particular needs of such equipment furnished with the aim of ensuring a safe and reliable operation of the plants in the event of electrical and mechanical disturbances or in case of mal-operation by the plant personnel shall be taken into consideration.

The signals and command to be transmitted are given in Particular Technical Specifications.

All equipment, instruments and devices in the substation necessary for supervisory, remote and local control as well as for protection, signalling and indication shall be included in the Bid and hence the Contract, it being understood so that the enumeration found in Scope of Works, in this respect is indicative but not limiting.

3.1.12 Interface between Contractors and towards Employer

For substations to be upgraded, all connections shall be made and all equipment and drawings beprovided by the Contractor to ensure proper operation of the complete plants, although this shouldnot be specifically mentioned in the Scope of Works Section. The Employer will for such stations,supply to the Contractor within one month from the date of commencement all documentation available for adaptation to the existing plant.

All equipment specified under the various lots within a plant. Specified in the Particular Technical Specifications and Scope of Works shall constitute a complete and functioning systemtogether with equipment covered by any other lot even if this lot is contracted by separate contractor. The Contractor shall pay special attention to the Power Transformers. All necessaryequipment and connections required to form a complete working plant and not mentioned underthe Power transformer shall be included in the

switchgear contract whether or not specifically mentioned in these Particular Technical Specifications.

The Contractor shall supply and execute all cable connections between the control room and thetransformer marshalling boxes and cabinets as well as supply all AC power for motors and DC voltage for control, indication and alarm purpose. The Contractor shall also provide all necessaryconnections to the control system from other sources like voltage and current transformer terminals, etc.

The Contractor shall connect the transformer to the grid and supply clamps for the transformer bushing. He shall also design and construct the transformer foundations based on Transformer Contractor's specifications and drawings and supply and erect LV cables from auxiliary transformer terminals to the auxiliary voltage board.

For the substations to be refurbished or extended the Contractor shall provide and make drawingsof the cable connections from actuators, sensors, transducers and relays to the Distributed Control Units as well as all materials required. He shall also document the adaptation to the existing plant with complete circuit diagrams, cable lists etc. including proper cross references.

The Contractor shall connect the switchgear to the line landing span erected by the LineContractor.

SECTION VI- SCOPE OF WORKS

33/11KV PRIMARY DISTRRIBUTION SUBSTATIONS

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4.0 GENERAL SCOPE OF SUBSTATIONS WORK

4.1 General

The Bidder shall examine the scope of works in this section in close connection with the other documents and particulars forming these Bidding Documents.

Special attention shall be paid to General Specifications and Particular Technical Specifications, in which the general technical requirements are specified. The drawings enclosed in are for biddingpurposes only.

If the Specifications and/or Drawings do not contain particulars of materials or goods, which are necessary for the proper and safe completion, operation, and maintenance of the equipment in question, all such materials shall be deemed to be included in the supply.

In the event of any conflict between the Drawings and the Specifications, the latter shall prevail.

In the event of any conflict between scaled dimensions and figures on the Drawings, the figures shall prevail.

Should the Bidder find discrepancies in or omissions from these Specifications or from the other Documents, or should he be in doubt as to their meaning, he should immediately contact the Project Manager for interpretation, clarification or correction thereof before submitting his Bid. Such action shall, however, in no case be considered as a cause for altering the closing date of theBid.

The scope of work for equipment shall cover engineering design, manufacture, testing before shipment and packing sea worthy or otherwise as required, delivery DDP site, of all equipment asspecified in the preceding chapters.

For substations contracted on turn-key basis the substation contractor shall be responsible for design, supply material, transport, erection, installation, test and commissioning as well as havingthe full responsibility for civil works including design and construction of transformer foundationsand control building.

The Contractor shall design and construct the transformer foundations with oil collection pit, oil trap (Oil interceptor) and fire damper consisting of crushed stones laying on a galvanized steel grating. Fire wall shall be constructed where necessary.

Loose equipment for the Employer's rehabilitation shall be complete with documentation and ancillaries like programs, licenses and programming tools.

Equipment that is to be dismantled and removed from existing substations is to be recovered by the Contractor and deposited to sites within or in the immediate vicinity of each substation. Such

sites are to be designated by the Employer. The recovered equipment is to be taken over by theEmployer at these sites.

4.1.1 Standard Substation

This section defines the standard substation components. The actual Scope and quantities to beincluded in the price schedules are found for each substation in the subsequent sections.

4.2 33/11kV Substation

4.2.1 Transformer Bay

1 (one) complete bay shall be equipped with:

a 1 (one) Transformer

b. 1(One) HV and 1(One) LV Circuit breaker

c. 1 (One) HV and 1(One) LV motorised isolator with Earth switch

d. 1 (One) HV and 1(One) LV motorised isolator without earth switch

e. 2 (two) sets of LV and HV surge arrestors/diverters

f. 1(one) complete sets of three-phase line including clamps for the flying bus bars and for connection between the gantries, to the transformer bushings, to the bus bars and to and betweenthe equipment.

g. 1(one) set of HV and LV current transformers, and Neutral CT with Isolating Neutral link

h. 1 (one) set of HV bus bar Voltage transformer

j. 1 (one) set of LV bus bar Voltage transformers

k. 1 (one) set of steel structures for equipment support.

l. 1 ((one) Numerical IEC 61850 compatible Bay control unit communicating to SAS with properdisplay, for measurements (V, I, MVAR, MW)
Protection IEDs shall be IEC 61850 compliant for SAS functions.

m. Numerical Tap changer voltage regulating relay (AVR) compliant to IEC61850 standards.

n. Multifunctional Measurement Unit/meters and Energy meter with 0.2 accuracy class.

o. 1(one) protection relay panel and 1(one) Control panel

p. 1 (one) numerical Restricted Earth fault IED compliant to IEC 61850 standards

q. HV and LV numerical Overcurrent & Earth fault IED compliant to IEC 61850

r. Numerical differential protection relay compliant to IEC 61850 standards

s. Numerical Sensitive Earth fault relay compliant to IEC 61850 standards

t. One-unit Digital Annunciation IED for Alarms and trips compliant to IEC 61850 standards. The annunciator shall have at least 16 windows

u. 1(one) lock-out trip relay with electrical and manual reset facilities

v. 1(one) set of MCB's, terminal blocks and wiring to form a complete operative bay control.The control scheme shall incorporate SCADA (operation) signals, indications and commands.

w. Multifunctional energy meters with a 0.2 accuracy class.

4.2.2 33kV Line Incomer Bay

1 (one) complete bay shall be equipped with:

a. 1 (one) Circuit breaker

b. 1 (one) motorised Isolator with Earthing switch
c. 1 (one) set of bus bars materials
d. 1 (one) complete set of three-phase line including clamps for the flying bus bars and forconnection between the gantries, to the bus bars and between the apparatus.
e. 1 (one) set of current transformers
f. 1 (one) set of surge diverters
g. 1 (one) set of voltage transformers
h. 1 (one) set of steel structures for support
i. 1 (one) Control and protection panel equipped with Discrepancy switches for breaker and Isolator controls (Open/Close & position indication), Multifunctional measurement instruments, Bay control IED with Overcurrent & Earth faulty back up protection and Auto-reclose function, Mimic diagram and Annunciation IEDs, Semaphores etc.
Bay control unit shall conform to IEC 61850 and capable to communicate to SAS with proper display, for measurements (V, I, MVAR, MW etc.)
j. 1 (One) (Main line protection) numerical distance protection IED with auto-reclose function that is 61850 compliant for SAS integration.
k. Set of trip circuit supervision relays
l. 1 (one) lock-out trip relay with electrical and manual reset facilities
m. 1 (one) set of MCB's, terminal blocks and wiring to form a complete operative bay control.
n. Multifunctional energy meters with a 0.2 accuracy class.

The control scheme shall be prepared for SCADA operation, signal, command, indications andAuto-reclose function must be selectable with an external mechanical Switch.

4.2.3 Bus Bar Protection

1 (one) Bus bar protection and control panel for 33/11 kV bus bar

4.3 Transformer bushing CTs technical details

The power transformer shall be installed with Bushing current transformers as per power transformer specifications.

4.3.1 Bushing current transformer technical data

The 2.5MVA 33/11KV shall have bushing current transformers with 3core in the HV and 3 coresin LV whose ration shall be 150/1A for HV and 400/1A respectively.
Neutral winding shall have 3cores whose ratio shall be 400/1A. Class and burden shall be asspecified below;

Table 4.3.1 Technical details for Power Transformer Bushing CTs

HV Winding			**LV Winding**		**Neutral**	
Core	Class	Burden	Class	Burden	Class	Burden
1	5P20	15VA	0.5	15VA	5P20	15VA
2	5P20	15VA	5P20	15VA	5P20	15VA
3	PX	Vk=350V, Ik=30mA	PX	Vk=350V, Ik=30mA	PX	Vk=350V, Ik=30mA
4	-	-	PX	Vk=350V, Ik=30mA	-	-

4.3.2 Outdoor Current transformer technical data

The 33 and 11kV outdoor current transformers shall have four cores whose Ratio, Class and Burden shall be as specified in Table 4.3.2. LV and HV windings for the current transformers for this project shall be made of high-grade copper. Aluminium windings shall not the accepted. Where in the attached specifications require use of Aluminium or Copper windings, it shall be ignored. The Current transformer rated short circuit withstand current shall be 25kA for three (3) seconds.

The CTs shall also meet all the other requirements contained in the attached Specificationsfor 33 and 11kV current transformers.

Table 4.3.2: Outdoor Current transformer technical parameters

36kV			**11kV**			
Transformer/Line Bay			**Transformer Bay**		**Feeder Bay**	
Core	Ratio	Class/Burden	Ratio	Class/Burden	Ratio	Class/Burden
1	600/300/150/1-1-1A	0.2/15VA	800/400/200/1A	0.2/15VA	400/200/100/1-1-1A	0.2/15VA
2	600/300/150/1-1-1A	5P20/15VA	800/400/200/1A	5P20/15VA	400/200/100/1-1-1A	5P20/15VA
3	600/300/150/1-1-1A	5P20/15VA	800/400/200/1A	5P20/15VA	400/200/100/1-1-1A	5P20/15VA
4	600/300/150/1-1-1A	PX/Vk=350V Ik=30mA	800/400/200/1A	PX/Vk=350V Ik=30mA	400/200/100/1-1-1A	PX/Vk=350 V Ik=30mA

Note: *If the Current Transformer Short Circuit Current Withstand, Ratio, Burden and Class in the **attached CT specifications** differ with the values given in the scope for the works, the **parameters** in the scope of works shall apply(prevail).*

4.4 Outdoor Voltage transformer technical data

The technical parameters for 33kV and 11kV Voltage transformer for this project shall meet following requirements in addition to those specified in attached specifications for outdoor Voltage transformer.

4.4.1 Voltage transformer LV and HV windings shall be made of high-grade copper,Aluminium windings shall not be accepted in this project.

4.4.2 Metering core accuracy class shall be **0.2** and not **0.5** as specified in the attached specifications for Voltage transformers.

4.4.3 Voltage transformer short circuit current withstand shall be 25kA for three (3) seconds.

4.5 11kV feeder Bay - Outdoor Switchgear

4.5.1 11kV transformer Outdoor Feeder Bay

1 (one) complete 11KV outdoor feeder bay shall be equipped with:

(a) 1 (one) Circuit breaker
(b) 1 (one) Motorised Isolator with earth switch
(c) 1 (One) Motorised Isolators without earth switch
(d) 1 (one) Set of bus bars materials
(e) 1 (one) Set of current transformers
(f) 1 (one) Set of surge diverters
(g) 1(one) Protection and control panel per two bays
(h) 1 (one) lock-out trip relay with electrical and manual reset facilities
(i) Set of discrepancy switches for Circuit breaker and Isolators control & Indications complete with mimic diagram.
(j) 1(one) IEC 61850 compatible Bay control and protection IED with 3-phase over current & Earth faulty protection, Sensitive Earth fault and auto re-close function, communicatingto SAS with proper display, for measurements (V, I, MVAR, MW (one) with display and measuring functions
(k) Multifunctional measurement units/IED
(l) 1(one) set of MCBs, terminal blocks and wiring to form a complete operative bay control.The control scheme shall be prepared for SCADA operation and Auto-reclose function must be selectable with an external switch.
(m) Set of trip circuit supervision relays
(n) Common energy metering panel for all 11kV feeder out lines
(o) Multifunctional energy meters with a 0.2 accuracy class.

4.5.2Auxiliary Transformer Bay

1 (one) complete bay of local transformer supply shall be equipped with:

a) 1(one) 100KVA 33/0.433kV auxiliary transformer
b) 1 (one) set of expulsion fuses and fuse mount for HV Protection
c) 1 (one) set of bus bars jumpers and steel support structures
d) 1(one) set of fuse cut out and fuse mount for LV protection
e) 1lot of four-core XLPE LV Power cable complete with termination accessories.
f) Set of HT Surge diverters

4.5.2.1 Current Transformers for neutral current measurements

(a) 1 (one) current transformer for transformer neutral current measurements complete with Neutral isolating link.

4.5.2.2 Lightning Arresters

(a) 11kV lightning arresters shall be erected close to the LV side of the power transformer

4.5.2.3 Transformer Bay Bus Bar material

(a) 1(one) lot of 33 and 11kV Aluminium alloy tubular bus bar and fittings of correct current rating and size for the HV and LV transformer bays. Where conductor bus bar instead of tubes is approved for use by employer it shall

be a double 300mm^2 AAAC

4.5.3 Auxiliary transformer for 33/11kV Substations

(a) 1 (one) 33/0.415 KV, 100 kVA, Dyn11 Auxiliary transformer with low voltage fusesshall be installed outdoor on the 33kV Bus bar of 33/11kV Substations.

4.5.4 Control, Protection, Metering and Substation Automation

(b) One transformer protection and one transformer bay control panel
(c) One protection and control panel for every two feeder outs
(d) One 33kV incoming line protection and control panel
(e) Separate panel for energy metering for all the substation circuits
(f) Flexible stranded steel wire armoured 2.5mm^2 copper multicore cables for protectionsignals, commands and control.

4.5.4.1 Substation Automation System General

1(one) lot of complete Substation Automation System (equipment and software) for substation control, operation and monitoring.

To the extent the internal control and interlocking system for the equipment supplied is not included for that particular equipment, it shall be included herein. All interconnections needed to form a complete installation shall also be included herein.

The control system specified hereunder shall include all necessary equipment for control, protection, metering and signalling. The system shall include all instruments, meters, switches, position indicators, inscriptions and mimic diagrams, protective and auxiliary relays, terminal blocks, internal wiring and any other equipment required to form a complete installation.

Drawings showing the control system, protection units and the boards as they are proposed shallbe supplied with the Bid.
The space needed for the boards should not exceed the available space.
Information defining the internal local control communication protocol shall be submitted withthe Bid.

Complete sets of schematic diagrams for control, protection, indication, metering, signalling, alarms, etc. shall be supplied as part of the project and shall be subject to the Project Manager's approval.

The requirements as to submission of diagrams, drawings and other documents with the Bid and after award of Contract are stated in the standard form of contract.

4.5.4.2 Scope

The supply and services to be performed by the Contractor shall comprise the design, manufacture, factory testing, packing, transport, insurance, unloading, storage on Site, construction works and erection, corrosion protection, site testing, submission of documentation, commissioning, trainingof KAA's personnel and warranty of the works.

The proposed SAS system for the above work should offer at least the following functionality: -

- Full operational control, reporting, alarm and indication facilities for the substation from theRCC's (Supervisory level).
- Full operational control, alarm and indication facilities for the substation from the HumanMachine interface (HMI) workstations in the substation control room (Substation Level).
- Operational control of each new circuit/bay from the protection relay panel using the baycontrol unit LCD display (Bay level).
- Control of each item of plant from the Local Control Cubicle (LCC) (Local Level)
- The control facilities from each control point are to be interlocked (hardwired) to prevent operation of any device simultaneously from more than one control point.
- At least one fully operational control point shall remain available in the event of a single equipment or communications failure.
- Complete facilities must exist for the proper lockout and maintenance tagging of circuits and plant items to ensure the safety of personnel and the security of the system
- The SA system shall use open communication protocols (IEC61850, IEC60870-104) and bereadily interfaced with third party devices operating on open protocols. The Tenderer shall describe such interfaces and provide an experience list of devices with which the offered control system has previously been interfaced.
- However, the contractor shall provide and clearly label all the required signals and commands for Telecom and SCADA integration at the control panels' Terminal Block.

The proposed SAS shall typically include but not limited to following features:

4.5.4.3 Station Level

- Two independent Gateways (Main and standby) for communications to the SCADA system.
- Configuration and parameterization software with one-time licenses fully paid.
- One Operator Workstation/HMI-OWS, and the complete workplace (desk, chair & Filecabinet).
- One Engineering Work Station-EWS (Industrial) to be installed in Panel.
- Colour printer to print screen shots
- Satellite clock, complete with GPS Receiver, Antenna and necessary timesynchronization ports.
- Interface for laptop computer for maintenance, information transfer and emergencyHMI
- Laptop Computer for maintenance, information transfer and emergency HMI
- Inverter system for SAS (including OWS, EWS and Printers).
- Communication network equipment [station (system) LAN, Field CommunicationNetwork, Various optical couplers, etc.
- interface for control and monitoring of the circuit/bay

4.5.4.4 SCADA Interface

(a) 1(one) lot complete system (equipment and software), with communication

gateway, data concentrator etc. for interface to the Regional (RCC) SCADA system and to the National (NCC) SCADA system using IEC60870-104 protocols.

(b) However, the contractor shall provide and clearly label all the required signals and commands for telecom and SCADA integration at the control panels' Terminal Block.

4.5.4.5 Control and Measuring Cables

(a) All external cables, conventional or fibre optical, for control, protection, measuring, indication, etc., for the complete plant shall be included. Wiring between the switchyardapparatus, transformers, the board(s) and the control system in the control building andthe interconnections between the various apparatus in the switchyard shall be included.

4.5.4.6 Telecommunications

a) This shall include all necessary equipment in substations and Control Centers as described in varies sections of work scope under telecommunication.

b) In order for the SCADA data to be transferred to the control centers, the bidder shall design and commission an appropriate communication system with a gateway capable of data and speech communication based on IEC60870-104 protocol. Equipment supplied shall be digital and latest technology and shall comply with the latestITU-T, IEC, ITU-R, IEEE and ETSI standards. It is required that one remote subscriber be implemented in the substation. Interface for data transmission shall be according to ITU-T Recommendation V.24 or V.35. Bit error rates of $1x10^{-6}$ shall not be exceeded.

c) It is the responsibility of the contractor to interconnect with existing SCADA and Telecommunications system. However, use and extension of existing infrastructure wherepossible shall be encouraged.

d) The Tenderer shall acquaint himself with all the sites and determine the requirements fortowers or masts to suit his design. When a new tower or mast is necessary is necessary, the Tenderer shall supply drawings for the proposed installation. All towers shall be 36 m and self-supporting. The tenderer shall provide details of loading and guy stresses formasts or towers to be erected on buildings. All antennae mounting components includingwave-guides, cables, cable clamps and external cable connectors shall be specified.

e) Where PLCs are to be used or where the T-offs affect existing PLC communication links,blocking line-traps including support structures shall be in scope of supply.

f) All communications equipment installed in the country must be type approved by the Communications Authority of Kenya (CAK). The Contractor will obtain the type approval.

g) The Contractor shall provide a list of recommended spares, the quantities and prices to last for a period of five (5) years after expiry of guarantee period.

h) The contractor shall offer training for six (6) technical appointees of the employer for 2weeks at manufacturer's premises. The contractor shall provide

necessary configurationsoftware pre-installed on a maintenance laptop with a onetime software license.

4.5.4.7 Scope of works - Telecommunication

The scope includes detailed system design, manufacture, supply, installation, testing, commissioning, remedying of defects, maintaining the works during the defects liability periodand any incidental work necessary for the proper completion of the work in accordance with this contract. Scope shall include integration of STM-1/4 and IP phone system to the existing KAA Network Management System.

Telecommunication equipment in order to achieve data and speech routing to control centres, Survey and necessary preparation works on existing systems, Equipment and substations to achieve specified functionality shall be in the scope of supply. All stations shall be equipped with two (2No.) IP telephones extensions communicating control centre and office block via fibre optic.

All communication equipment supplied under this project shall be type approved by the regulator, Communication Authority of Kenya (CAK) and the Kenya Bureau of Standards (KBS) where applicable. It is the responsibility of the contractor to obtain these necessary approvals.

4.5.5 Auxiliary AC supply equipment

4.5.5.1 Main AC Distribution Board

1 (one) main distribution board designed for minimum 200A rating with necessary numberof panels as indicated below: Auto Change Over scheme for two 3-Phase 415Vac supply sources to be incorporated. Auto Change Over scheme for 2.5MVA transformation capacity substations and above shall incorporate but not limited to.

(a) 1 (one) Circuit breaker, Manual and Auto operation incorporated, minimum 250A,for the feeder from the station supply transformer.
(b) 2 (two) current transformers 100/200/1/1A with two cores, one core for measuring and one for protection.
(c) 1 (one) constant time overcurrent and Earth fault relay.
(d) 1 (one) A-meter function with selector switch.
(e) 1 (one) V-meter function with selector switch.
(f) 1 (one) lot of feeder Miniature Circuit Breakers with electro-magnetic and thermalreleases. The breaker ratings shall be chosen to suit the different consumers to be connected. 20% of the breakers of each size shall be spare and readily mounted.

4.5.5.2 Sub-distribution Boards and Panels

(a) 1(one) lot of all necessary sub-distribution boards and panels (including the distribution panel for lighting and small power of the control building). The boards shall be completely equipped with correct rate copper bus bars, MCBs, Fuses etc. Contactors, motor starters, instruments, operating switches, push buttons, indicating lamps, etc., shall be included whenever required. 20% of the breakers of each size shall be spare and readily mounted.

4.5.5.3 Cables

(a) 1 (one) lot of all necessary armoured (steel wire) flexible copper power and control cables for supply to the main distribution board and to the sub-distributionboards, panels and equipment except for the cables for lighting and small power which are included in the civil Goods under separate contract.

4.5.6 DC Supply System

4.5.6.1 Battery

(a) 1 (one) 110V DC system using Vented Nickel-Cadmium (Ni-Cad) Batteries with acapacity of 265Ah/10Ah for a 2.5MVA 33/11kV substations.
(b) The 48V DC system for telecommunication equipment and RTU using Vented Ni-Cadbatteries with 165Ah/10h capacity rating.
(c) The 110 and 48V battery cells shall be Vented Nickel-cadmium type with a nominalVoltage of 1.2V per cell.

Batteries and shall be installed in separate room with explosion proof exhauster fan of correct rating.

4.5.6.2 Charger System

(a) 1 (one) DC charger for the 110V/265Ah battery.
(b) 1 (one) DC charger for the 48V/165Ah Battery.

Note: The battery and Charges shall meet KAA's/ KPLC's and IEC specifications and general requirements

The chargers shall be complete with instruments, MCBs on AC and DC supply side and protection.The chargers shall have auxiliary contacts for collection of status, alarms and measurands signals for the SCADA system.

4.5.6.3 Distribution Board

1 (one) Distribution Board 110VDC and 48VDC system

The board shall be installed with following equipment amongst others:

(a) 1 (one) MCB with magnetic and thermal release for the feeder from the charger and battery.
(b) 1 (one) A-meter with shunt for each battery.
(c) 1 (one) V-meter with selector switch for the voltage between the poles and betweenpoles and earth for each battery.
(d) 1 (one) set of contacts on the front for banana jacks for the battery voltage and earth.
(e) 1 (one) battery monitoring devices with alarm contacts.
(f) 1 (one) lot of all necessary circuit breakers and miniature circuit breakers for theoutgoing feeders and circuits.
(g) 20% of the breakers of any size shall be spare and readily mounted.
(h) All necessary materials and instruments required for complete functioning of the DCsupply systems.

4.5.6.4 Battery Conductors and Fuses

(a) 1 (one) set of conductors for the battery in the battery room.

(b) 2 (two) single pole fuse boxes with main fuses for the battery, placed on the wallinside the battery room, and two fuses for the battery monitoring device.

4.5.6.5 Sub-distribution Boards and Panels

(g) 1 (one) lot of all necessary sub-distribution boards and panels.

The boards shall be completely equipped with bus bars, miniature circuit breakers, fuses, etc. Contactors, motor starters, instruments, operating switches, push buttons, indicating lamps, under-voltage relays with alarm contact, etc., shall be included whenever needed.

4.5.6.6 Cables

(a) 1 (one) lot of all necessary DC power supply armoured copper cables and associatedmaterials, including wiring to the apparatus in the switchyard.

4.5.6.7 Earthing System

An Earthing network shall be installed comprising the following:

(a) 1 (one) lot of underground Earthing system covering the platform and control buildingwith risers. The minimum grid conductor (bear earthing copper) shall be 95mm^2.

(b) 1 (one) complete set of "above-floor" Earthing system for the control building, asapplicable, with connections to the risers from the under-ground system.

4.5.7 Ancillary Equipment

4.5.7.1 Station Equipment

(a) 2 (two) self-contained, rechargeable, portable hand-held lights.

(b) 1 (one) audible alarm system with the necessary wiring.

(c) Emergency lighting to be provided in the substation building.

(d) 1 set of fire detection system in the control building

4.5.7.2 Earthing Devices

(a) 1 (one) set of three phase portable Earthing harness for outdoor 33kV and 11kV with operating rods/link sticks suitable for Earthing of the bay conductors and busbars.

(b) 1 (one) set of voltage indicators for 33kV and 11kV with audible and visual indication for voltage

4.5.7.3 Cable Accessories

(a) 1 (one) lot of all connecting material, cable boxes and material for fixing the cables. Terminals, glands and terminal labels shall be included in the material requirement

4.5.7.4 Racks, Conduits, Ducts, etc.

(a) 1 (one) lot of all cables, racks and trays, conduits etc. to the extent

necessary for the proper distribution of cables. All the conduits and protection tubes, wherevercables may deteriorate or where cable laying may otherwise present difficulties shall be used.

4.5.7.5 Substation Power transformers

To be supplied as specified for each substation, and in accordance with below data.

4.5.7.6 Type of transformers

Main data for the transformers that shall be supplied:

Pos.	Rating MVA (ONAN/ONAF)	Voltage	Tapping range	OLTC
7	2.5/n.a	33/11	± 2*2.5 %	no

Transformers in Coastal region- shall be of vector group: YNyn0d1(with stabilizing winding).

4.5.8 Civil Works

4.5.8.1 Platform works

Platform, equipment foundations, plot perimeter wall, earthworks, cable trenches, roads anddrainages shall be constructed as specified in particular specifications.

4.5.8.2 Switchgear Buildings

Switchgear buildings shall be constructed as specified in particular specifications for switchgearbuilding. Shall be installed with rain water harvesting system
In addition, a guardhouse with toilet facilities located at the main gate shall be constructed.

4.5.8.3 Transformer foundations

Transformer foundations shall be constructed as specified in particular specifications.

4.5.8.4 Cable Trenches

Cable trenches shall be constructed as specified in particular specifications.

4.5.9 Site Visit

In practicing due diligence, the contractor is specifically advised to inspect the site & terrain and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour. The bidder is advised to visit and examine the site where the plantis to be installed and its surroundings and obtain for itself on its own responsibility all the information that may be necessary for preparing the bid. The bidders shall ask for necessary clarifications required for clearly understanding the scope & technical /commercial requirementsof the tender from KAA before submitting their offer.
There shall be a mandatory pre-bid site visit to all the site as stated in section one instruction to bidders.

4.5.9.1 Inspection and test at site

During the construction and after the installation of each item of equipment under the Section VIItests shall be performed, as specified herein, to establish the accuracy of the assembly and to provethe adequacy of the materials and the workmanship. All tests and tests procedures shall be approved by the (Project Manager) Employer.

The Contractor shall perform the following tests of each subsection, for all items where applicable, to ensure that the equipment has been correctly installed, all necessary adjustments and settings made, and that the item is in sound condition to run under load.

4.5.9.2 Inspection during erection of equipment

(a) Appearance checks of all equipment
(b) Calibration of pressure gauges
(c) Protective relay check
(d) Oil tightness check and gas leakage tests
(e) Measurement of the resistance of the main circuit

4.5.9.3 Test after equipment installation

1. Substation Switchgear.

a. Circuit breakers

i. Closing and opening operation test
ii. Trip-free operation test
iii. Manual operation test
iv. Remote operation test
v. Main Contact resistance test
vi. Breaker timing (closing time and opening time)
vii. Measurement of insulation resistance

b. Disconnecting switches

i. Operation test (manual and remote)
ii. Check of interlock mechanism
iii. Measurement of insulation resistance
iv. Main Contact resistance

c. Lightning arresters

i. Measurement of insulation resistance

d. Current transformers

i. Measurement of insulation resistance
ii. Ratio test
iii. Polarity check
iv. Magnetization curve to confirm knee point
v. Accuracy class test

e. Voltage transformers

vi. Measurement of insulation resistance
vii. Ratio and Polarity check.

2. Control, measuring and protective equipment

a. Control and measuring equipment

i. Comprehensive relay tests
ii. Measurement of insulation resistance
iii. Sequential operation check
iv. Calibration of meters
v. Relay Secondary injection

b. Protective relaying equipment

i. Individual relay calibration and Functional tests
ii. Residual voltage (current) measurement
iii. Measurement of burden
iv. Current and voltage transformer circuits grounding point check
v. Sequential operation test at each station by primary and secondary injection tocheck sensitivity and stability
vi. Station to station operation performance tests (transmission line protective relayingequipment only).
vii. Test on Trip and alarm circuits
viii. Stability, Operation, and Sensitivity of transformer unit schemes
ix. Test of Auto-reclose schemes
x. Calibration Tests on all Instruments
xi. Calibration Test on Energy meter

3. Miscellaneous materials

a. Outdoor bus

i. Measurement of insulation resistance

b. Power cables

i. High voltage test
ii. Insulation resistance measurement

c. Control cables

i. Insulation resistance measurement

d. Complete bay's test

i. Primary injection
ii. Compressive functional tests

4.5.10 Training in Major Equipment

The training if required shall be for 6 (Six) KAA engineers for each of the courses indicated here in. The training shall be held at the manufacturer's factory. All training, accommodation costs and air travel costs transport costs at manufacturer's premises and Air fare shall be met by the Contractor. The training shall cover design, application, testing, commissioning and maintenance of the relevant digital control and protection systems. The training course shall have a minimum of 2 (two) weeks duration. The training shall be biased towards principles of substation design, equipment Construction & installation, SAS & Telecommunications and Protection

4.5.11 Factory acceptance test

The Contractor shall arrange for 2 participants from KAA and and the resident Project

Manager to witness tests of major equipment listed below in the manufacturer's plant. All routine tests shall be carried out in the presence of the Employer's representatives. The Contractor shall arrange for the FAT and meet cost of local transport, accommodation and training at manufacturer's factory.

The Major Equipment includes:

- Circuit breakers / Auto -reclosers
- Protection and control system
- Power Transformers
- Power Cables and conductors
- Instrument transformers
- Disconnectors
- SAS & Telecommunications Equipment
- DC system equipment

FAT shall be carried out as prescribed in the particular technical specifications of the equipment.

4.5.12 Test Equipment

This shall be as described in Particular Technical specifications of all the major equipment.

4.5.13 Final documentation

a) Witnessed commissioning tests carried out.
b) Signed test results for all major equipment.
c) As built drawings in 4 paper copies delivered in box files as approved by project manager;4 Hard disk with copies of the drawings (all drawings in AutoCAD and PDF) and one Softcopy in hard drive
d) Operation and maintenance manuals in 4 paper copies delivered in box files as approved by project manager; 4 Hard disk soft copy in hard drive
e) Installation software and configuring files for all SAS, telecoms. and protection equipmentand a copy in hard drive.
f) Back up for the system and files in hard drive (HDD)

4.5.14 Facilities for the KAA Project Team

4.5.14.1 Site Offices

At the location where the Contractor will establish his main site, an administration office for site supervisors from the Project Manager with basic office furniture, drinking water, internet, telephone and a copier shall be provided by the contractor for the implementation period.

4.5.14.2 Communication Facilities

The contractor shall supply 4Nos. Mobile phone and Air-time equivalent to KES 20,000/= per month for KAA's Project Implementation team. The communication facilities are subject to approval of the project manager.

4.5.14.3 Commissioning and drawing approval Laptops

The contractor shall supply five (5) laptops for design and substation commissioning: 3

laptops shall be loaded with backup files and most recent software for SAS, control and protection. The application software and shall be running on most recent MS window OS and with unlimited licenses period-perpetual license. One laptop shall be loaded with MS application packages, AutoCAD etc. runningon most recent MS window 64-bit OS, Intel core i9. The application software licenses shall have unlimited period-perpetual license. The commissioning laptops shall be subject to project manager approval.

4.5.14.4 Transport

The Contractor shall avail transport services on a 24hour basis to site for the KAA Project Manager and his team for the entire Contract period. The Vehicle to be provided shall be 5seater, 4X4 wheel drive and at least 3000cc Engine capacity. The contractor shall bear the cost of fuelling, servicing and driving etc. The vehicle is subject to the approval of project manager.

4.6 GENERAL SCOPE FOR 33 AND 11KV LINES

4.6.1 General

The Bidder shall examine the scope of works in this section in close connection with the other documents and particulars forming these Bidding Documents. Special attention shall be paid to Technical Specifications, in which the general technical requirements are specified. The drawingsenclosed in are for bidding purposes only. If the Specifications and/or Drawings do not contain particulars of materials or goods that are necessary for the proper and safe completion, operation and maintenance of the equipment in question, all such materials shall be deemed to be included in the supply.
In the event of any conflict between the Drawings and the Specifications, the latter shall prevail. In the event of any conflict between scaled dimensions and figures on the Drawings, the figuresshall prevail. Should the Bidder find discrepancies in or omissions from these Specifications orfrom the other Documents, or should he be in doubt as to their meaning, he should immediatelycontact the Project Manager for interpretation, clarification or correction thereof before submittinghis Bid. Such action shall, however, in no case be considered as a cause for altering the closingdate of the Bid.

The scope of work covers; supplies of equipment, engineering and design, manufacture, testing before shipment and packing sea worthy or otherwise as required, delivery of all equipment CIP site, construction and installation and commissioning.

Where the new line shares the route with existing lines, the scope of work shall include all thenecessary works/modifications that will be required to accommodate the lines along the same route. The conductors of the existing lines shall be re-used while new hardware/fittings of correcttype and size shall be used.

The term "transfer" in this scope of works shall mean supply of new hardware/fittings, new concrete poles, stays, insulators as well as installation of these in the existing line routes. It also includes moving all equipment, such as distribution transformers, auto-reclosers, switches and links, capacitor banks etc., mounted on the present poles over to the new poles. Also, all existing poles, conductors and hardware/fittings shall be recovered and handed over to the stores atlocations most near to the installation sites.

<u>Cross arms:</u>
Steel cross-arms shall be used in all cases including re-conductoring. All steel cross arms shall begrounded, and shall meet international accepted standards in addition to specifications.

Bus bar and Line conductor

Transformer bays (HV and LV) for 2.5MAV 33/11kV substation and above shall use high grade tubular Aluminium alloy, or 2 x 300mm^2 AAA Conductor. 33 and 11kV Overhead line conductorsshall be 150mm^2 ACSR, while 75mm^2 ACSR conductor shall be used in 0.415kV LV Overhead lines. Material for tubular bus bar shall Aluminium-magnesium-silicon tubes in accordance with IEC 60114. They shall be designed to withstand thermal and dynamic stresses under normal duty and maximal short-circuit current without damage. Fastening shall be such that thermal expansion is accommodated without any undue stresses.

Conductor Joints and Termination's

All joints and terminations shall be of compression type for conductors of 75mm^2 and above.

Poles:

Concrete poles shall be used in all 33 and 11kV overhead line construction, wooden poles are notaccepted. Concrete poles shall meet specification on concrete poles.

Shield Wires:

OPGW (Optical Ground Wire) shall be used in all the 33kV and above line Voltages. The standardsize used by is 48 cores single mode Optic fiber. Where the 33kV line is done in underground cable, an Underground Fibre Optic cable will be laid together in the trace of the MVcable. Where the Source line does not have OPGW or there is no nearest point where OPGW can be tapped for the new lines, the ADSS (All-dielectric Self-Supporting Cable) shall be installed asan alternative. The use of ADSS in such cases is specified in the scope of works for substations and Lines.

4.6.2 Factory Acceptance Test

The contractor shall meet the cost of FAT for two (2) KAA and Engineer participants and the residentproject manager. Accommodation and Air travel cost shall be met by the employer. The following major equipment shall be offered for inspection

- 150 and 75mm^2 ACSR Conductor
- Bus bar conductor materials
- OPGW and or ADSS
- 11KV and 33kV MV Cables if required

4.7 DEFINITE SCOPE OF 33/11KV SUBSTATIONS AND ASSOCIATED LINES

The scope of work shall involve design, supply, installation and commissioning of 2.5MVA 33/11kV substation, and associated 11kV underground cable to the main power board equipment at Moi International Airport (MIA) in Mombasa

4.7.1 No. 33/11kV Substation

The scope includes installation of a new 1x 2.5MVA, 33/11kV substation, one bay for 33kV incoming line and two (2) bays for 11kV feeder outs. The new line Bay materials, fitting, insulators, and steel support structures shall be used. Line works shall include laying construction of 400m of 11kV underground single circuit line in 95mm^2 aluminium armoured cable from the new substation to the existing main station at the airport and

installation of 1nos. 100KVA, 33/0.415kV substations.

Separate Staff Office Building

In addition to the Control/Switchgear building a separate staff office building with a floor area of50m^2 (5 x10 m) shall be constructed within the substation plot. The Office Building shall be demarcated from the HV Switchyard by use of chain link with a gate. The construction and materials shall meet specifications given under particular specifications for substation civil works.

The Office Building shall have an open office room Store room mearing 3x3 square meters with a door, Kitchen with Cabinets, dish rack, oven cooktop and sink. Toilet facility (2nos) and Washrooms with gender separation showers rooms and disability features. The building shall alsohave a sloped roof with insulation, fire retardant ceiling, rainwater harvesting system with elevated1,000 Litre water tanks, Electrical, Plumbing, Foul water Management, Air conditioning and firedetection and Suppression system. Appropriately emergency door shall also be provided for fire escape.

The design, facility locations and construction materials for the office building shall be subject toapproval by the project manager.

4.7.1.1 MIA -MOMBASA 33/11kV Substation Bill of Quantities

Item	Item Description	Unit	Qty	Rate	Total
MTD 001	2.5MVA, 33/11 kV transformer	Pc	1		
MTD-002	33kV Circuit breaker	Pc	3		
MTD-003	33 kV motorized Isolator with earth switch	Pc	2		
MTD-004	33kV motorized Isolator without earth switch	Pc	2		
MTD-005	33kV Bus bar Voltage Transformers	Pc	3		
MTD-006	33kV Current transformers	Pc	6		
MTD-007	33 &11kV Transformer Bay, 33kV line bay and Bus bar conductor materials	Lot	1		
MTD-008	33kV and 11kV transformer bay, 33kV line bay, Gantries and Steel Support Structures	Lot	1		
MTD-009	33 kV Surge Arresters	Pc	6		
MTD-010	33kV OH line protection and Control panel with BCU	Pc	1		
MTD-011	Transformer relay panel with AVR relay	Pc	1		
MTD-011A	Transformer Bay control panel with a BCU	Pc	1		
MTD-012	11kV Bus bar Voltage Transformers	Pc	3		
MTD-013	11kV Circuit breakers	Pc	2		
MTD-014	11kV Current transformers	Pc	6		
MTD-015	11kV motorized Isolator without Earth switch	Pc	2		
MTD-016	11kV motorized Isolator with Earth switch	Pc	2		
MTD-017	11kV Surge arrestors	Pc	12		
MTD-018	11 kV Neutral isolating link with Neutral CT	Pc	1		
MTD-019	11kV feeder control and Relay panel (1panel for 2 feeders), each Bay shall have one Bay control and protection unit	Pc	1		
MTD-020	11kV lines bay Steel Support Structures	Lot	1		
MTD-021	11kV Lines Bays Bus conductor materials	Lot	1		
MTD-022	Auxiliary transformer 100kVA 33/0.420kV, with HV expulsion fuse, surge arrestors and LV fuse Cut outs protection system	Lot	1		
MTD-023	Common Energy metering panel for 33kV & 11kV Circuits	Pc	1		
MTD-024	3Phase-415V Auxiliary Supply System complete with AC Distribution Board and two source 3-phase Auto change over panel	Pc	1		
MTD-025	110VDC/265Ah and 48VDC/165Ah Battery Changer and Battery bank system	Lot	1		
MTD-026	110VDC and 48V DC supply distribution boards system	Lot	1		
MTD-027	Substation Automation System (SAS)/SCADA equipment	Lot	1		
MTD-028	2.5mm^2 stranded wire armoured flexible multicore copper cables for signal, command and measurement	Lot	1		
MTD-029	MV and LV Earthing system for the substation	Lot	1		
MTD-030	Substation Switchyard Lighting system	Lot	1		
MTD-031	Substation Lightning protection system	Lot	1		

Item	Item Description	Unit	Qty	Rate	Total
MTD-032	Telecommunications (SDH) panel and associated expansion materials	Lot	1		
MTD-033	Office facilities and communication equipment: IP Phone, Printer, UPS Inverter for HMI Workstation, Desk and Chairs)	Lot	1		
11kV Line Materials					
MTD-035	3phase 11kV U/G line in 95 mm^2 CU XLPE armoured cable complete with fittings and other necessary accessories	Lot/Km	0.5		
MTD-045	Single mode 48 Cores OPGW, ODF & Splice Boxes	Lot/Km	0.5		
Substation Works					
MTD-101	Transformer foundation complete with Oil soak pit and Sump	Lot	1		
MTD-102A	Control /Switchgear building (minimum floor area of 120m^2) as per Particular specifications on control building complete with Water supply and harvesting system	Lot	1		
MTD-102B	Demarcated Office Building with a floor area of 50 square meter complete with facilities and rain water harvesting system	Lot	1		
MTD-103	Cable trenches (Excavation, Ducts, Trench covers, Cable trays etc.)	Lot	1		
MTD-104	Platform works (Earth work, equipment foundations, Drainage, Weed control, Ballasting etc.)	Lot	1		
MTD-105	Equipment steel Structure and Bays erection, Earthing, substation lighting & lightning protection and associated electromechanicalworks	Lot	1		
MTD-106	LV and Control cable works, Control & relay panel and associated works.	Lot	1		
MTD-107	Substation equipment installation, Control & Protection testing and commissioning	Lot	1		
MTD-108	Substation perimeter wall, Guard house & Toilet and Access roads in Cabro blocks inside Substation	Lot	1		
MTD-109	Telecommunication and SAS installation (LAN) testing and commissioning	Lot	1		
MTD-110	Substation design works (Electrical, Mechanical, Civil, Automation, Telecom, Control & Protection engineering)	Lot	1		
MTD-111	All statutory approval/Supervision fees for substation and Lines	Lot	1		
MTD-112	Site office and communication facilities for KAA Project Implementation team	Lot	1		
MTD-113	Control room Office facilities and communication equipment: IPPhone, Printer, UPS Inverter for HMI Workstation, Desk and Chairs)	Lot	1		
MTD-114	Transport services for KAA Project Implementation Team for the entire contract period	Lot	1		
33 and 11kV Line Works					
MTD-115	11kV Line Overhead and underground Line route Survey and Line design works	Lot/Km	0.25		
MTD-116	11kV Line Civil and structural works	Lot/Km	0.25		
MTD-117	11kV line Construction, testing and commissioning	Lot/Km	0.25		

4.7.1.2 Substation and Associated Lines ESHS Works

The contractor shall implement the following worksite key ESHS activities in addition to any otherenvironmental, social, health and safety (ESHS) activities required in the works specifications.

7.1.2.1 The cost of ESHS Scope shall be deemed to have been factored in the pricing ofsubstation and lines works. No spate pricing is required for this contract.

Substation and Associated Lines Key ESHS Works	
ESHS 01	**Air Pollution Management (Noise and Dust Control)**
	Suppress dust during dry periods by watering areas/Cover stock piles of soil
ESHS 02	**Solid Waste Generation**
	All solid waste management and disposal, including provision of Pit latrines/Portable toilets and sanitary materials
ESHS 03	**Occupational Health & Safety at worksite**
	a. Training local workers and subcontractors on ESHS issues and creatingawareness to the workers on social and health issues.
	b. Creation of Covid-19 and HIV & AIDS awareness, and provision of materials for control and prevention to the workers in collaboration with county government health agencies.
	c. Provision of water for drinking, handwashing and soap. Provision of hand sanitizers in worksite offices
	d. Maintain a fully stocked and accessible first aid kit and trained first aider.
	e. Provision of appropriate PPEs (Clothing and equipment for all workers at site)
ESHS 04	**Public Health and safety**
	Proper securing of worksite to control access, and hazard communication to the public by use of appropriate warning signages
ESHS 005	Local stakeholder/leaders and community engagement to create conducive environment for project implementation

PARTICULAR TECHNICAL SPECIFICATIONS - TRANSFORMERS

TABLE OF CONTENT

4.8 PARTICULAR SPECIFICATIONS- POWER TRANSFORMERS

4.8.1 General

This Specification provides for the manufacture, supply, testing before shipment, delivery, erection and commissioning of the transformers detailed in Scope of Works. Particular reference is also made to General Specification, General TechnicalSpecification, Project Specific Data and IEC 60076.

The transformer shall be designed for a 40 years lifetime under full load operation and besupplied together with all ancillary equipment for a complete installation.

All connections and contacts shall be of ample section and surface for carrying continuously **120 %** of the specified current without undue heating. Fixed connection shall be secured by bolts or set screws of ample size, adequately locked. Lock nuts shall be used on stud connections carrying current.

On outdoor equipment, all bolts nuts and washers in contact with non-ferrous parts that carry current shall be of phosphor bronze.

Wherever possible, bolts shall be fitted in such a manner that in the event of the nut working loose and falling off, the bolts will remain in position.

4.8.1.2 Power Transformers

4.8.1.2.1 Design Criteria

4.8.1.2.1.1 Service Conditions

The transformer shall be capable of operating continuously outdoors at any tapping during the ambient conditions specified in the section: "Project Specific Data"

Note that the average maximum ambient temperature in any one day is 40 °C. The maximum temperature rise shall therefore not exceed 55 °C of the top oil and 60 °C of the winding above the maximum ambient temperature of 40 °C.

For temperature correction due to attitude reference is made to IEC 60076 which limits the temperature rise further when tested a normal altitude. The altitude used in the calculations shall be 60m a.s.l.

4.8.1.2.1.2 Rating

The transformers shall comply with the ratings specified in Scope of Works under the stated service conditions without exceeding the temperature rise limits specified above, over the complete tapping range. If the voltage on the secondary (LV) side is reduced or raised by up to 5% from the rated voltage, the temperature rises of any part shall not rise by more than 5oC (at rated power on any primary tapping).

4.8.1.2.1.3 Tapping

All tappings shall be designed for constant kVA output, the rated voltage of each winding of the transformer on the principal tapping shall be as specified in Scope of Works and unless otherwise specified, shall correspond to the system nominal voltage. The tapping ranges shall be as specified in Scope of Works.

4.8.1.2.1.4 Noise

The transformer, tap-changing equipment and supplementary cooling equipment shall operate without undue noise and every care shall be taken in the design and manufacture to reduce noise to the level of that obtained in good modern practice. The noise level of the transformer shall not exceed 78dB (A) when tested in accordance with IEC 60076.

4.8.1.2.1.5 Radio Interference

The design of the transformer shall be such that they will not cause any objectionable interference with radio reception in the vicinity of the transformer, either by direct radiation or by transmission through the power-lines and system to which the transformer may be connected, when energising at full rated voltage and when delivering any load up to the continuous maximum rating.

4.8.1.2.1.6 Interchangeability and Parallel Operation

All transformer of any one type shall be identical and interchangeable with one another. No alteration to control circuits shall be permissible for this purpose except by means of built-in terminal boards fitted with links for effecting the alteration. All parts are to be made accurately to dimensions so that any corresponding parts will be interchangeable and any spare parts will fit into place without need of adjustments. Where similar equipment has previously been supplied, components shall interchange with those on previous contracts, unless otherwise approved.

The transformer shall be suitable for parallel master-follower operation with each other and with previously supplied transformer of similar rating which shall remain in service on the substations covered by this contract, both in respect of transformer characteristics and control circuits on all relevant taps. The new and old transformers shall share the load subject to the tolerances of impedance and voltage laid down in, IEC 60076.

4.8.1.2.1.7 Insulation Levels

When assembled complete with connections as in service, electrical clearances in air shall be adequate to withstand the required impulse withstand voltage given in Project Specific Data. The Bidder shall propose in his Bid details of bushings with drawings showing air clearances and creepage distances. The creepage distance shall not be less than 31mm/kV line voltage in Coast and industrial area and 25mm/kV for inland installations. Care shall be taken to ensure that no fittings are located so as to interfere with the external connections to the bushing terminals.

The insulation test levels are given in Project Specific Data. All transformers shall be designed for full insulation on all terminations also the neutral termination.

4.8.1.2.1.8 Short Circuit Performance

The transformer shall be capable of withstanding, without damage, the effects of a symmetrical three-phase short circuit and a phase to earth short circuit under conditions specified in IEC 60076.

It can be assumed that during a short circuit, nominal voltage will be maintained on one side of the transformer with a short on the other, the external impedance being zero. It can also be assumed that up to four transformers may be connected in parallel between HV and LV bus bars.

4.8.1.2.1.9 Frequency

The normal frequency will be 50 cycles per second. The transformer shall, however, be suitable for continuous operation with frequency variation of plus or minus 2.5 % from the normal, without exceeding the temperature rise limit specified.

4.8.1.2.1.10 Flux Density

The maximum flux density in any magnetic component under any condition of voltage and frequency specified under all the operating conditions given in these specifications shall not exceed 1.9 Tesla.

4.8.1.2.2 Construction

4.8.1.2.2.1 General

Transformers shall be of the oil immersed "core" type (i.e. not "shell" type) suitable for outdoor use, they shall be dried out at the manufacturer's works and it should be possible to commission them without further dry out.

Designs shall be such that water does not collect on any of the equipment. Particular attention shall be paid in the design of all equipment to ensure that there is not damage to working parts or insulation through the ingress of dust, insects or vermin which are prevalent for long periods in the year.

4.8.1.2.2.2 Cores

The transformer core shall be built up of laminations of the best quality non-ageing (CRGO) cold-rolled grain-oriented silicon sheet steel of high permeability and low loss coefficient. All joints between laminations shall be of the interleaved type and the laminations shall be clamped securely. Bolting of the core should be avoided to reduce losses. On no account shall butt joints be offered. The cross-section of the core shall form an approximate circle.

The laminations shall be separated by hot-oil proof insulation, and the clamping of the frame shall be firm to ensure even pressure over the whole of the core laminations so as to prevent undue vibrations or noises.

The core sheets shall be insulated with high-grade oil-proof insulation, for example magnesium-silicate-phosphate. Paper will not be accepted.

The core clamping arrangement and framework shall be efficiently insulated from the cores and withstand a test voltage of 2kV, 50 HZ during 1 minute. The core shall be designed and built up in such a manner as to avoid accidental or slow development of short circuit paths through the iron and framework.

The core, framework, clamping arrangements and general structure of the transformer shall be of robust design, capable of withstanding any shock to which they may be subjected during transport, installation or service.

Suitable axial cooling ducts shall be provided to ensure free circulation of oil and efficient cooling of the core. The ducts shall be proportioned so that the maximum temperature at any point will be within the prescribed limits of temperature rise.

Lifting lugs or other similar means shall be provided for conveniently lifting the complete assembly (with windings).

Provision shall be made for efficient arrangement of guides to prevent movement of the core and windings during transport, installation or service.

The framework of the core shall be so designed as to prevent the presence of oil pockets, which would prevent complete emptying of the oil from the tank through the drain valve.

4.8.1.2.2.3 Windings

The windings shall be circular and consist of high-quality enamelled copper wire/ rectangular copper strips, wound with age resisting paper of high dielectric strength. The current densities in the windings shall be stated in the Bid.

The amount of insulation between turns shall be determined not merely by normal volts per turn, but also by due consideration of the line voltages and the service conditions, under heavy lightning storms.

Adequate insulation and clearances between the windings shall be provided and all insulation and clearance between live parts must be adequate for operation at 5 per cent over the highest tap voltages on all the windings.

Phase and neutral shall be insulated for full design Voltage. **Graded winding insulation** shall not be allowed for HV, LV, Neutral or Tertiary windings.

The insulation of the end turns of each winding adjacent to the transformer terminals shall be reinforced between turns to protect the windings satisfactorily against surges and transients. Details of the reinforcements shall be given in the Bid.

None of the materials used shall shrink, disintegrate, carbonise or become brittle under the action of hot oil, to an extent lowering the lifetime below 40 years when the transformer is operated continuously at the maximum specified loading.

The windings shall be so placed that they remain electrostatically balanced with their magnetic centres coincident under all conditions or operation. To prevent excessive static voltage, static end rings shall be provided, wherever necessary, at the live end of the windings.

The windings, connections and trappings of the transformer shall be clamped in position and braced so as to withstand shocks or undue stresses during transport, short circuit conditions, and other transient causes. No mechanical movement of the coils should be possible with dead short circuit on the transformers.

All windings and all fibrous and hygroscopic materials used in the construction of the transformer, shall be dried under vacuum and impregnated with hot oil. Full details of the drying out and vacuum treatment shall be furnished by the Bidder.

Leads from windings to terminal board and bushings shall be rigidly supported to prevent damage from vibration and short circuit forces.

Adequate provision shall be made for the circulation of oil round and between the winding so that a low temperature gradient between the conductors and the oil is assured and any danger of excessive local heating is avoided.

The finished width of any duct and clamping arrangement shall be such as not to impede the free circulation of oil through the ducts.

It is essential that the windings shall be subjected to a thorough shrinking and seasoning process, so that no further shrinking of windings shall occur at site.However, clamping arrangement shall be provided for taking up any possible shrinking of coils when in service. All similar coils shall be strictly interchangeable. Full detailed description of the windings shall be submitted with the Bid.

When specified in Scope of Works, stabilising windings shall be provided. The windings shall be capable of withstanding the forces to which they are subjected underall conditions, particularly the forces due to a short circuit between terminals or between any terminal and earth with full voltage maintained on all other windings intended for connection to external sources of supply. When stabilising windings are to be used for purposes other than decreasing zero sequence impedance, this will be declared in the scope of work and the windings must be designed accordingly.

Unless otherwise specified, only one terminal of the stabilising winding shall be brought outside the tank and a suitable bushing shall be provided for this purpose through the tank cover. When used additionally for an auxiliary supply each corner ofthe winding shall be brought out.

It shall be possible to earth the winding externally to the main tank by means of a flexible bolted link to be provided by the supplier between the terminal and a suitablepad on the tank cover.

The neutral points of star connected windings shall unless otherwise specified in Scopeof Works be brought out to bushings located on the tank cover and connected to an earthing bus attached to the main transformer earth terminal.

Where the star point of a winding is not specified to be brought out through a neutral bushing, the connection shall, nevertheless, be available under the main tank cover plate to permit the subsequent fitting of a neutral bushing. The subsequent installationof this bushing shall not necessitate any alteration to, or repositioning of existing fittings.

4.8.1.2.2.4 Internal Earthing

Each part of the core shall be electrically earthed to the transformer tank. The internal earth connection shall be of the detachable link type and shall be located in an accessible position.

The magnetic circuit shall be earthed to the clamping structure at one point only through a removable link placed in an accessible position beneath an inspection opening in the tank cover. The connection to the link shall be on the same side of the

core as the main earth connection and be taken from the extreme edge of the top yoke. The main core clamping structure shall be connected to the tank body

Magnetic circuits having an insulated sectional construction shall be provided with a separate link for each individual section and the arrangement of the connections shall be to approval.

Where oil ducts or insulation parallel to the plane of the laminations divide the magnetic circuit into two or more electrically separate parts, the ducts or barriers shall be bridged and the magnetic circuit shall not be regarded as being of sectional construction.

Where coil clamping rings are of metal, each ring shall be connected to the adjacent core clamping structure on the same side of the transformer as the main earth connection.

All earthing connections, with the exception of those from the individual coil clamping rings, shall have a cross-sectional area of not less than 90 mm2. Connections inserted between laminations may have the cross-sectional area reduced to 25 mm2 where in close thermal contact with the core.

4.8.1.2.2.5 Transformer Tank

Each transformer shall be enclosed in a steel tank of welded construction, suitably stiffened by means of channel or angle sections welded to the tank, for withstanding the stresses imposed during transit to site and subsequent operation with no signs of oil leakage. The transformer tank shall have a removable lid on top, i.e. "Bell" type transformer tanks are not permitted.

The tank shall be complete with all accessories and shall be designed to allow the complete transformer (tanked and filled with oil) to be lifted by crane or jacks, transported by road, rail and water without overstraining any joints and without causing subsequent leakage of oil. Corrugated tanks are not acceptable.

The tanks must be so constructed as to be capable of withstanding an internal positive pressure of not less than 70kPa without any permanent deflection of any parts. The tank must also be capable of withstanding a vacuum of 50mm of mercury absolute when emptied of oil.

Guides shall be provided inside the tank to facilitate the lowering into the tank of the core and coils and their raising and correct positioning. The guides shall extend from the bottom of the tank to within 150mm of the top of the tank.

The tank covers shall be of adequate strength and shall not be distorted when lifted in the lifting eyes to be provided. Inspection openings/manholes suitably bolted shall be provided as necessary to give easy access to bushings, tap changer connections and earth connections. Each inspection opening shall be of ample size for the purpose for which it is provided. Covers for such openings shall not weight more than 25kg and shall be provided with lifting eyes.

A rail for connection of safety belt shall be arranged on the tank cover.

All oil-pipe connections shall have flanged joints provided with gaskets, preferable set-in grooves or held in position by stops to prevent over compression of the gaskets.

Four jacking lugs shall be fitted 500mm above ground level and four holes with a diameter of not less than 50.8mm shall be provided on the jacking lugs in order to permit the transformer to be slewed in any direction.

The base of the tank shall be reinforced and so designed that it shall be possible to move the complete transformer unit in any direction without injury when using rollers, plates or rails. A design which necessitates rails being placed in a particular position shall not be used.

Wheels, where specified, shall be plain, flanged uni-directional or bi-directional, whichever is specified in Scope of Works. Bi-directional wheels shall be designed so that it is possible to change the direction of the wheels without removing them from the transformer, and provision shall be made for locking the wheels parallel or at right angles to the major axis. Grease nipples or cups shall be provided for lubricating the swivel bearings and the wheel bearings. The Employer will provide the wheel gauge.

Lifting lugs shall be fitted capable of lifting the transformer complete with windings and filled with oil.

The tank cover shall be fitted with pockets for a thermometer and for the bulbs of the winding temperature and oil temperature indicators specified. Protection shall be provided when necessary for each capillary tube. The thermometer pocket shall be fitted with a captive screwed cap to prevent ingress of water. The pockets shall be located in the position of maximum oil temperature and it shall be possible to remove the instrument bulbs without lowering the oil in the tank.

The tank and cooling equipment shall be designed to permit vacuum treatment on site. The maximum safe permissible vacuum (millimetres of mercury) which may be applied above oil level, to the tank, cooling equipment and to the conservator, without causing permanent distortion, shall be stated in the Bid.

Two earthing terminals located at opposite side of the tank, capable of carrying for 30 seconds the full lower voltage current of the transformer, shall be provided. Provision shall be made at positions close to each of the four bottom corners of the tank for bolting the earth terminals to the tank structure to suit local conditions.

4.8.1.2.2.6 Gaskets

Oil-resisting synthetic rubber gaskets will be preferred. If cork or similar material is used oil-resisting synthetic rubber be applied as a bonding medium. The Contractor shall submit details of gasket material for approval.

Spare unused sets of gaskets shall be supplied for use on site for all positions where joints have to be made after transportation of the transformer.

4.8.1.2.2.7 Current Transformer

Current transformer for winding temperature measurements shall be mounted inside the transformer on a bushing turret, and in the connection between winding and neutral point for auto-transformers.

Accuracy class 3 or better shall be used for temperature indication.

4.8.1.2.2.8 Current Transformers

Phase and Neutral Current transformers as indicated in scope of works shall be mounted in the bushing turrets.

4.8.1.2.2.9 Bushings

Bushings shall be fitted to the equipment as specified in Scope of Works. Bushings for 66 kV and above shall be of the condenser type. Other bushings may be of solid porcelain.

All terminals shall be marked to correspond with the markings on the diagram plate.

The transformer bushings shall withstand accidental arcing or flashover without seals or other vital parts becoming damaged. Stresses due to expansion and contraction in any part of the bushing shall not lead to development of bulges, hair-line cracks or other defects. Suitable connecting clamps shall be able to absorb shocks due to vibration of the connecting jumpers. The bushings shall withstand internal vacuum in the transformer tank.

All the bushings of any transformer shall have a rated current of at least 120% of the rated currents of the windings to which they are connected (in order not to limit over- loads).

4.8.1.2.3 Painting and Galvanising

Oil-filled transformer shall have their interior surfaces sandblasted and finished with two coats of anti-corrosive and oil-resistant priming paint. Exterior surfaces shall be sand-blasted and have two rust inhibiting priming coats and one intermediate coat with paint on zinc chromate or urethane alkyd basis or equivalent; one final coat of weather and oil resistant paint. Minimum total thickness shall be 0.16 mm.

The radiator external surfaces shall be hot-dip galvanised with a zinc deposit on average not less than 400g/m2.

Outdoor control and marshalling boxes/cabinets shall have at least one prime coat and two layers of paint on zinc powder basis to be applied after perfect cleaning.

The particulars of priming and finishing paintings shall be stated in the Bid, with specifications of paint, together with a listing of colours available, for each of the plant and equipment.

The Employer is not bound to accept the finishing colour proposed by the Bidder. Determination of colour shall be at the option of the Employer and shall be finalised at the time of approval of drawings.

The exterior finish of outdoor control cabinets shall be in the same colour as that for the transformer.

Should any paint work be damaged during transit or erection, this shall be made good on site.

All interior and exterior surfaces, subject to corrosion, that cannot readily be painted, or where galvanising is explicitly specified, shall be hot-dip galvanised with an average thickness not less than 0.1 mm. Bolts and nuts associated with galvanised parts shall be hot-dip galvanised.

4.8.1.2.4 Fittings

The transformer shall be supplied with the fittings specified in Scope of Works. These fittings shall comply with the following clauses.

4.8.1.2.4.1 Conservator

The conservator shall be mounted on the main tank but not obstruct connection to overhead connection.

The conservator shall be fitted with a removable end on which shall be mounted the oil gauge. The conservator tank shall be mounted to slope lightly downwards towardsthe drain valve, which shall be adjacent to the removable end.

The pipe connecting the conservator to the tank shall extend at least 50 mm into the conservator and shall be brought out from the highest point of the main tank cover. A valve shall be provided immediately adjacent to the conservator. All pockets and bushing turrets of the main tank shall be connected into this pipe between thetransformer and the Buchholz relay.

The conservator shall be so dimensioned that it will permit all expansion over the working range of temperatures from no load with the transformer cold and at -5 °C ambient air temperature to full load at 45 °C ambient air temperature while the sump pipe remains covered with oil and the oil level is visible or indicated. In any case, thevolume of the conservator shall be at least 10% of the transformer oil volume.

The oil connections from the transformer tank to the conservator vessel shall be arranged at rising angle to the horizontal. The Buchholz relay (see Clause 4.6) shall befitted in this pipe in such a position that inspection, testing and dismantling is possiblewith the transformer in operation. A step valve shall be provided between the conservator and the relay.

The conservator shall be equipped with the following fittings:

a) A sump formed by extending the inlet pipe inside the conservator.
b) A manhole formed by bolting one end-plate of the conservator.
c) A drain valve with flanged plug.
d) A flanged filling plug.
e) An oil level gauge.
f) A filter valve.

4.8.1.2.4.2 Dial-type Oil Gauges

Dial-type oil gauges, where specified, shall be of the magnetically operated type, in which breaking of the gauge glass will not release any oil. The gauge shall be fitted with at least two circuit-closing, potential free, low-oil-level alarm contacts wired to the marshalling box.

4.8.1.2.4.3 Silica-Gel Breathers

Each conservator shall be fitted with a silica-gel type dehydrating breather to approval. The breather shall be provided with an oil cup or other device which prevents contact between the dehydrating agent and the air outside the transformer. If an oil cup is provided, the oil should be visible from the outside and the lowest oil level should be marked.

The weight of the dehydrating agent shall be not less than 0.5 kg per 1500 litres of oil in the transformer and cooler.

Unless the silica-gel container is transparent the breathers shall have a window for inspection of the colour and condition of the silica-gel.

4.8.1.2.4.4 Explosion-Vents

An over-pressure device of the spring release type or similar shall be used for pressure relief in case of explosion or sudden overpressure. The type shall be approved by the Project Manager. Separate oil compartments as OLTC compartment shall have separate explosion vents.

The explosion-vent shall be provided of sufficient size for the rapid release of any pressure which may be generated within the tank and which might result in damage to the equipment. The device if used shall be so placed that any discharge from it will not be deposited on any part of the transformer or its associated equipment.

4.8.1.2.4.5 Buchholz Relays

Buchholz relays shall be of the double-float type with separate floats for alarm and shut-down at low and high speed gas development and shall be of approved manufacture suitable for operation in transformer oil as specified over the temperature range -10 °C to 115 °C The two contact sets shall not be exposed to oil and shall be wired to the marshalling box.

The relays must be interposed in the connecting pipe between the oil conservator and the transformer tank in such a manner that all gas from the tank must pass through the relay as it rises to the oil conservator.
Two copper pipes shall be connected to the two pet cocks on the relay and extended to position 1 m above ground level and fitted with stop cocks for sampling and testing purposes. The stop cocks are to be labelled and easily accessible and be clear of surrounding steel-work. The sight window of the relay shall be readily visible from ground level. Separate oil compartments compartment shall have separate Buchholz relays. However the OLTC chamber shall be equipped with pressure rise relay instead.

4.8.1.2.4.6 Temperature Indicators

The local temperature indicators shall be of the dial-type graded in °C with a manually resettable pointer to register the highest temperature reached. The local indicators shall be mounted on the transformer tank in a suitable

weatherproof steel cabinet with a lockable door. The cabinet shall be so positioned as to allow easy access to and readability of the gauges.

Each transformer shall be provided with winding temperature indicators of the "thermal image" type compensated for changes in ambient temperature (one for each winding type: common, series, HV, LV and tertiary as appropriate). The indicator shall have a load - temperature characteristic approximately the same as the hottest part of the windings. The primary current transformer for operating the indicator shall be builtinto the main transformer tank on the bushings. Information shall be included in the maintenance instructions in the form of either a graph or table showing the relationship between current injected into the heater coil and the corresponding temperaturereading.

The indicators shall be provided with two sets of alarm/trip contacts, adjustable to close at any temperature between 45 °C and 150 °C such adjustment being possible without dismantling the instrument. Where supplementary forced cooling is specified,two additional set of contacts shall be provided on the winding temperature indicators,for automatic start of the cooling fans in two stages. The differential between "switch on" and "switch off" temperatures must also be variable in the range 15 °C to 30 °C.

The instrument and set points shall have an accuracy of ±1% of full scale deflection and the indicated temperature must reflect the hot spot temperature to within ± 3 °C under all operating conditions. Test links are to be provided for calibration purpose.

One temperature indicator of the capillary type for measurement of the top oiltemperature shall be provided for each transformer.

4.8.1.2.5 Cooling

4.8.1.2.5.1 Definition

The types of cooling shall be designated by the IEC lettering symbols:

a. Natural Air Circulation (ONAN)
   - By radiators directly attached to the tank.

b. Forced Air Circulation (ONAF)
   - By fans cooling the radiators.

4.8.1.2.5.2 Declaration of Ratings

The Bidder shall declare in the Schedule of Technical Guarantees the rated power available under the operating conditions ONAN or ONAF (as required in Scope of Works) and the ratings shall be indicated on the rating plate.

4.8.1.2.5.3 Radiators

The transformers shall be fitted with detachable radiators (tube coolers are notaccepted). Suitable valves, with blanking plates shall be provided at the inlet and outletof each radiator so that it may be removed without draining oil from the tank. Inlet andoutlet valve "OPEN" and "CLOSED" positions shall be

clearly marked. The valves shall be readily accessible and easy to operate. Lifting facilities, a drain cock and an air release vent shall be provided on each radiator.

Radiators shall be hot dip galvanised and designed so that it is possible for the whole of the cooling surface to be cleaned. They shall also be designed so that they shall withstand dry-out vacuum without distortion or causing leakage of hot oil.

4.8.1.2.5.4 Forced-Air Cooling ONAN/ONAF

The forced-cooling equipment shall be designed to start automatically from winding- temperature relay control at predetermined temperatures recommended by the Contractor. The equipment shall be designed to start in 2 stages at pre-set temperatures.

Indicate setting values are as follows:

Stages	**On**	**Off**
Stage 1	65°C	50°C
Stage 2	75°C	60°C

The cooler arrangement must allow for the maintenance or failure of any one fan or radiator without losing more than 20 % of the total cooling capacity.

All fans shall operate as a unit. Fan blades and fan ducting shall be of aluminium alloy,stainless steel, galvanised steel, or other corrosion-resistant metal and shall be designed to keep noise and vibration to a minimum. All fans shall be provided with galvanised wire-mesh guards. It shall be possible to remove fan assemblies complete without dismantling other equipment.

4.8.1.2.5.5 Cooler Capacity

The coolers and fans shall be so dimensioned that at least 80 % of the transformer capacity remains (in both ONAN and ONAF) if one cooler or one fan is removed.

4.8.1.2.5.6 Cooler Control Equipment

All the necessary automatic control, motor contactors, protective devices and switchesfor the forced-cooling equipment shall be assembled in cabinet or marshalling box mounted on the transformer.

The cooler control equipment shall include:

- An isolating switch rated to carry and break full-load current for each group of fan and pump motors.
- A "Cooler Auto" - "Cooler-Manual" changeover switch.
- Magnetic contactor for each group of fan motors. Contactor coil leads shall be wired to the terminal board. A set of normally-closed contacts shall be providedon each motor contactor for alarm purposes.
- Overload and single-phasing relays.
- Fuses, links and terminal boards to approval to make a complete assembly.

All equipment must be in accordance with the requirement given in general technicalspecifications.

4.8.1.2.6 Off-load Tap Changer

Auxiliary supply Transformer, if specified in Scope of Works, shall be provided witha ganged off-load tap changer operated by means of an external handle which can be pad-locked in each operating position. This switch shall have a rotary motion of operation. The tap positions shall be normally five (3) with nominal tap position being three (3). Off-load tap changer shall be manually operate and indelibly marked to indicate the tapping position corresponding to the diagram plate. The MV winding tapping range shallbe ±2 x2.5 %, and shall have five (5) tap positions.

The Auxiliary supply transformer shall meet specification on pole mounted distribution transformer. For the purpose of this project the LV winding shall be madeof copper, ***ignore where Aluminium LV winding is proposed as an alternative*** in the specifications for Distribution Transformers. **Aluminium LV winding shall not be accepted in this project**. The vector group of auxiliary transformers shall be Dyn11

Tap changers with Mercury sealing glands are not acceptable in this project.

4.8.1.2.7 Drain, Filter and Sampling Valves

4.8.1.2.7.1 General

All valves shall be attached by bolted-on flanges and shall not be screwed or welded to the tank. Drain valves or isolating valves larger than 101, 6 mm (4"B.S.P.) and of the double-flanged gate-type construction may have bodies of cast iron or cast steel. All valves shall be opened by turning counter-clockwise when facing the hand wheel.

Every valve shall be provided with an indicator to show clearly the position of the valve.

Means shall be provided for padlocking the valves in their open and closed position.

All valves shall be suitable for operation in conjunction with transformer oil as specified in IEC Publication 60296 at temperatures up to 115°C.

4.8.1.2.7.2 Drain Valves

Drain valves shall be of suitable dimensions in relation to the volume of oil in the transformer tank and coolers.

4.8.1.2.7.3 Oil Sampling Valves

Oil sampling valves shall be of the screwed globe type; handle or gate valves located so as to permit sampling of oil from the extreme bottom of the transformer tank and the bottom of the tap changer compartment.

4.8.1.2.7.4 Filtration Connections

Filtration connections, which shall have flanges drilled to BS 4504 Table 6, for 50,8 mm (2") valves, or screwed 50,8 mm (2"B.S.P.) female, shall be as follows:

A valve at the top and bottom of the main tank. The drain valve of the main tank maybe used for this purpose if of the size described above.

The oil conservator drain valve located within easy reach of the ground, by means of a pipe extension, if necessary, shall be suitable for a filter connection.

4.8.1.2.7.5 Valve Entries

All valve entries shall be blanked off with gasketed bolted-on plates or plugs.

4.8.1.2.7.6 Rating and Diagram Plates

Rating diagram and valve plates shall be to IEC 60076, stamped or embossed on brassor stainless steel. They shall show the employer's Order Number and shall have a blankspace for the Employer's serial number. The diagram plate shall show the internal connections and the voltage vector relationship of the terminals.

Where applicable, rating or diagram plates shall show locations, ratio, rating and accuracy class of current transformers. Rating diagram and valve plates shall be approved by the Project Manager.

4.8.1.2.8 Oil

The oil shall be of the uninhibited mineral type and comply with BS 148, IEC 60296 or equivalent standard. Oil shall preferably be supplied in bulk from within Kenya anddried and cleaned on site. If oil is provided in drums, these shall have a volume of approximately 200 l and be full. A separate price shall be quoted for transformer oil.

4.8.1.2.9 On-Load Tap Changers

4.8.1.2.9.1 General

The transformer's voltage control equipment shall, if specified in Scope of Work, be of the tap changing type for varying its effective transformation ratio whilst the transformer is on load and without producing phase displacement. The on-load tap changing equipment shall comply with IEC 60214. The tappings shall be arranged in the electrical centre of the higher winding.

The tap changing equipment shall be of the 3-phase type, preferably with combined diverter and selector switches and shall be designed so that it will not be possible for the main transformer winding to be open circuited or for a portion thereof to be short circuited, except through a transition impedance. The tap changers for transformer with higher capacity than 2.5MVA shall be of the vacuum type mounted inside the transformer, whilst lower capacity transformers may have conventional oil type.

Generation from any type of control shall cause one tap movement only.

The equipment shall be so arranged as to ensure that when a tap change has commenced, it shall be completed independently of the operations of the control relaysor switches. Failure of the auxiliary supply during a tap change operation must not inhibit the independent completion of the tap change operation.

An auxiliary supply of 415/240 volts, 50 Hz, 3-phase 4-wire AC. will be available foroperating the tap changing equipment and all its accessories. All equipment shall operate correctly at any voltage between the limits of 85 % and 115 % of nominal value.

The tapping ranges shall be ±8 x1.67%, with a maximum of 17 tap positions.Tap changing equipment shall be capable of carrying the same currents due to external short-circuit as the transformer windings and shall withstand the impulse and dielectrictests of the associated winding. The tap changer connection and switches shall be capable of handling continuously currents at least 20% above the highest operating current in order to limit overloading.

Where oil type used, it shall not be possible for the insulating oil in those compartmentswhich contain contacts for making or breaking current to mix with the oil in the maintransformer tank or with the oil in compartments containing contacts not used for making or breaking current

Drop-down tanks which necessitate the provision of pits in the foundations are not acceptable.

Where it is necessary to remove parts, or the whole of the on-load tap-changer for transport purposes, it shall be possible to complete erection on site with the transformerwindings covered with oil.

4.8.1.2.9.2 Construction

The number of the tappings in use shall be indicated mechanically at the transformer,electrically at the local control room panel and digitally at the Control Centre.

The tap-changing switches and mechanism shall be mounted in an easily accessible cabinet on the transformer tank and shall be supported from the main tank or its base.

The oil compartment for the tap changing switch shall be fitted with its own over- pressure device and Conservator; together with suitable oil level indication and drain valves. The conservator shall be dimensioned such that applicable expansion rates canbe met.

All switches forming part of the main tap-changing apparatus shall be readily accessible and it shall be possible to examine or repair such apparatus without loweringthe oil level in the main transformer tank.

Each compartment in which the oil level is not maintained from the conservator shallbe provided with an oil gauge of approved design.

Limit switches shall be provided to prevent the over-running of the mechanism and shall be connected directly in the circuit of the operating motor. In addition, mechanical stops or other approved devices shall be provided to prevent the overrunning of the mechanism under any condition.

Approved means shall be provided to protect the motor and control circuits.

The whole tap-changing equipment shall be of robust design and capable of giving satisfactory service without undue maintenance under the conditions to be met in service, including frequent operation.

An externally visible mechanical recorder shall be fitted to the mechanism to indicatethe number of tap-change operations completed by the equipment. At least five digitsmust be provided. No provision for resetting the counter is to be made.

4.8.1.2.9.3 Operation

The tap changer shall be operated in the following modes:

- From an automatic voltage regulator in the substation (normal control).
- The control is part of the switchgear contract.
- Directly on the motor control cabinet in the switchyard (direct control).
- From the control room in the substation (local control).
- From the Control Centre (remote control).

A blocking switch shall be provided on the motor control cabinet/marshalling box withtwo positions: local/remote (supervisory).

When the switch is in local position, control can only take place from the controlcabinet on the transformer and vice versa for the other position.

All the necessary equipment like relays, contactors, etc. shall be provided, wired up to terminal blocks to facilitate the functions outlined above. A potentiometer switch of the make before break type shall be provided for local and remote reading of tap position. The numbers shall range from 1 upwards, the lowest number representing a tapping position corresponding to the maximum number of high voltage winding turns, i.e. the highest plus-percent positions. The lowest minus-percent position shall be represented by the highest number. Cray or BCD codes shall be provided as an alternative for remote supervisory reading of tap position.

Unless specifically asked for in this document, all equipment for control and indicationrequired in the control room shall be provided by the supplier of the control room equipment. Operating voltage for direct and local control shall be Single Phase 230V AC/50Hz.

Facilities shall also be provided to prepare the transformer for parallel operation withone or more transformers on the master - slave principle. An out-of-step device shall be provided and arranged to prevent further tap changing after a definite time intervalwhen the transformer on parallel control is one tap out of step.

4.8.1.2.9.4 Tapping Switches

The switch shall be mechanically robust and provided with a device between the handle and the switch to permit operation without strain in the event of imperfect alignment between switch and handle; the switch operating shaft shall be fullyinsulated as between tank and switch and shall be provided with a suitable oil and vacuum tight gland where it passes through the tank.

The use of wood shall be avoided wherever possible and all the supports and terminalboards shall be completely unaffected by hot oil and non-moisture absorbent. High-grade insulating materials shall be used in the construction of tapping switches which shall be designed with special attention to the elimination of points where tracking is likely to occur.

4.8.1.2.9.5 Alarm and Trip Signals

All alarm contacts shall have ample inductive making and breaking at the specified alarm and tripping voltage.

Any auxiliary relays associated with the trip circuits shall be DC operated and suitablefor the specified alarm and tripping voltage.

Alarm and trip relays shall be provided with independent potential free contact.

The following alarms shall be provided, wired up to terminal blocks in the transformercabinet:

- Tap changer not operating.
- Transformers on parallel control are out of step.
- Partial or complete failure of the voltage transformer supply to the voltage regulating relay. This alarm shall be inoperative when the transformer is on non-automatic control.
- Fan failure, alarm.
- Gas relay transformer, alarm.
- Gas relay transformer, trip.
- Protective relay OLTC, trip.
- Oil gauge low level transformer, alarm.
- Oil gauge low level transformer, trip
- Oil gauge low level OLTC, alarm.
- Oil gauge low level OLTC, trip.
- Pressure relief device transformer operated, trip.
- Pressure relief device OLTC operated, trip.
- Top oil temperature high, alarm.
- Top oil temperature critical, trip.
- Winding temperature high, alarm.
- Winding temperature critical, trip.

4.8.1.2.10 Local Control Cubicles and Wiring Cabinets

Each power transformer shall be provided with a weatherproof (IP54) local mechanism/control cubicle for control of the tap changer and the same for instrumentation and control of cooling fans. The cubicle shall be mounted on the sideof the transformer tank. The cabinets and equipment installed there shall strictly followthe requirements found in general technical specifications.

All cubicles and cabinets shall be complete with the requisite front panels. Bidder shallprovide in their Bid a complete list of all control, alarm, protection and indication facilities and equipment included in the Bid price each item to be identified with its function.

All indicating analogue instruments shall be flush mounting and the dials shall

preferably be not less than 95 mm diameter if circular or, if rectangular have no side less than 95 mm.

An indelible chart showing lubrication points and specifying recommended lubricants and frequency of application shall be provided in all mechanism cubicles.

Provision for outgoing connections from the transformer control cubicles and cabinets shall be made for multicore cables. An undrilled removable glad plate to accommodate compression-type glands provided by the Employer shall be supplied. Each terminal box shall have an earthing stud for earthing of the incoming cable screens.

4.8.1.2.11 Wiring and Terminal Blocks

The switchgear contractor shall lay and connect control and power cables from the indoor control and switchgear to the local cabinets described above. All internal cabling between the transformer primary points and local cubicles and cabinets shall be provided by the Contractor. The cable laying and fastening shall be as described ingeneral technical specifications.

4.8.1.2.12 Manufacturing, Inspections and Tests

The Contractor shall document the progress in factory with photographic records of the progress included in the progress reports. These colour photographs shall upon completion of the works be submitted in bound form together with explanatory description to the Employer.

4.8.1.2.12.1 Inspection/Witnessing of Tests

The Employer and the Project Manager, reserves the right to inspect the transformer at any stage of manufacture or to be present at any of the tests specified. Such inspection shall not relieve the Contractor of his responsibility for meeting all the requirements of the specification, and it shall not prevent subsequent rejection if such material or equipment is later found to be defective.

The contract shall include financial provision for participation by the Employer in Factory Acceptance Tests as described in scope of works. The Contractor shall in good time inform when testing will take place and shall give the Employer/Project Managernot less than twenty-eight days' notice in advance. No transformer shall be tanked, ordespatched from the Contractor's works without approval of Project Manager. Based on the Contractor's manufacturing programme, factory inspection will take place as required by the Employer/Project Manager.

4.8.1.2.12.2 Factory Tests

<u>Bushing Tests</u>

The Contractor shall submit for approval test records and data for all bushings. These records shall show the test performed on the bushings including but not necessarily restricted to the following tests:

- Standard, one minute, 50 Hz dry withstand tests for all bushings.
- Type test of impulse withstand voltage.

All recorded test figures shall be given with the bushings serial number.

Transformer Tests

Routine Tests

Routine tests as far as applicable shall be carried out according the IEC Publication60076.
The following routine tests shall be applied to all transformer:

- Resistance measurements of all windings for all tappings.
- Ratio tests for all tappings and vector relationship tests.
- Measurement of no-load losses and currents.
- Measurements of impedance voltages (at maximum, principal and minimum tappings), short circuit impedances and load losses. Load losses shall be measured at both rated currents when ONAN and ONAF cooling are specified.
- Determination of efficiencies at 50%, 75%, 100% and 120% load at maximum temperature of the winding and 0.8 power factor lagging and unity power factorfor all ratings (ONAN, ONAF ratings).
- Zero sequence impedance measurement.
- Induced voltage and separate source voltage withstand power frequency, dielectric tests on all windings on all phases including neutral points.
- Full wave impulse withstand tests. The transformer shall be subjected to a complete series of tests. Such tests shall be applied to the HV winding line terminal of each phase as well as to the neutral points.
- Tests on on-load tap changers.
- Routine tests on all transformer accessories such as motors, contactors wiring,etc.
- Partial discharge measurements.
- Measurements of capacity between the windings and each winding and ground.
- Oil leakage test. The complete oil filled transformer with bushings and radiatorsfitted and any other attachment normally in contact with oil shall be tested at a positive pressure measured at the tank bottom of twice the column of oil in the transformer when the transformer is cold, but in any case, not less than 70kPa. Alternatively, the radiators may be tested separately with the same pressure. Thetest period shall be not less than 12 hours.
- Core insulation test, 2 kV, 50 Hz for one minute.

Special tests

- Chopped wave impulse test on each transformer. The test shall be carried out inconjunction with the full wave test as described in IEC 60076-3.

Type Tests
The following type tests shall be carried out on one transformer of each type:

- Temperature rise test. Details of the test procedure shall be agreed between Contractor and Project Manager before testing commences.

- Noise measurements.
- Vacuum test. The transformer tank and radiators filled with oil shall be subjectedto a vacuum test. Bushings need not be fitted and the radiators and conservator may be tested as separate units.

4.8.1.2.12.3 Site Tests

Testing at site by the Contractor shall be carried out to prove that the transformer in all respects complies with provisions and guarantees set forth in the Contract.

Tests shall include but not be limited to the following:

- Dielectric oil tests.
- Insulation dryness by an agreed method.
- Electrical and functional control of voltage control equipment and cooling system.
- Core to tank insulation.

4.8.1.2.13 Erection

Erection shall be carried out on foundations made by the switchgear contractor or by the Contractor under supervision by the Project Manager. The Contractor shall ascertain that the transformers have been erected according to the Terms of Contract before commissioning takes place.

All heavy erection equipment like lifting cranes and other equipment to be used for erection purpose shall be provided by the Contractor. The Contractor shall also provideall special equipment for erection and testing purpose. Such equipment shall be listedin the Bid.

4.8.1.2.14 Delivery and Transport

The transport to site is the Contractor's sole responsibility. Under road part of the transport, the transport must be in accordance with the rules for road transport in the respective countries. If any special investigations, permits or arrangements are necessary for the road transport these has to be arranged for by the Contractor. Cost for such shall be included in the price.

Shipment of transformer in any position other than the upright one is not permissible.

All shafts, bearings and machined surfaces exposed for transport to the site shall be given a temporary protective coating to prevent corrosion.

If it is necessary to remove bushings or radiators for transport blanking-off plates anda spare set of gaskets shall be provided.

Where the supply of oil is included in the contract, and transport weight limitations permit, the transformer shall preferably be transported with sufficient oil to cover the core and windings. The tank shall be sealed for transport to prevent all breathing. Theremainder of the oil shall be supplied separately at the time of delivery.

Alternatively, where the above method is not applicable or practicable, the transformershall be transported filled with dry nitrogen under slight positive pressure. This pressure and the temperature at the time of filling shall be communicated to the ProjectManager and a pressure gauge suitably protected is to be fitted to each transformer tofacilitate inspection of the gas pressure on arrival at site. Every precaution shall be taken to ensure that the transformer arrive at site in a satisfactory condition so that subsequent to oil filling, they may be put into service without the necessity for furtherdrying out. Should the positive gas pressure disappear during transport and the transformer allowed to breathe, additional drying out at site if required shall be the responsibility of the Contractor.

All accessories and spares which are shipped separately must be clearly marked for identification with the transformer for which they are intended. All pipe work and valves shall have further markings showing the correct points of assembly which shallalso be shown on assembly drawing to be supplied.

Full details must be supplied on methods of drying out the windings, if found necessary, on arrival and on the method to be adopted for oil filling and oil purificationon site. Any special apparatus required for oil filling must be supplied as part of this contract.

The transformer shall be shipped with an impact recorder having capacity of four months recording. Full details of the proposed methods of transport shall be submitted for approval.

4.8.1.2.15 Evaluation of Losses and capitalization

4.8.1.2.15.1 Guaranteed Output and Losses, Liquidated Damages

Failure to meet the guaranteed outputs and losses will be dealt with as follows:

4.8.1.2.15.2 Transformer Output

If the guaranteed continuous output at rated voltage of any transformer has to be reduced below the guaranteed value in order to maintain the temperature rises of any part of the transformer within the guaranteed limits, liquidated damages shall be paid at the rate of USD 2577 per KVA, interpolated for 25yrs the minimum transformer lifespan.

4.8.1.2.15.3 Transformer Losses

If the total transformer losses of any transformer, as determined by these, without anytolerances, at rated voltage, frequency and 100% rated kVA (on principal tapping) exceed the guaranteed total losses, the excess in losses shall be capitalised at the ratesstated in below and the resulting amount shall be paid as liquidated damages.

The payment on account of failure of one or more transformer to meet the guaranteedoutput and guaranteed losses shall be applied individually, as the case may be, and shall therefore be understood to be cumulative.

4.8.1.2.15.4 Rejection Limits

Should any transformer fail to meet the guaranteed output by more than 5%

(five per cent) or the total losses should exceed the total guaranteed losses by more than 1/5 (one fifth), and should the Contractor fail within a reasonable time to modify the transformer in order to increase the output and/or reduce the losses sufficiently, the Purchaser shall have the option to reject the transformer.

4.8.1.2.15.5 Evaluation of Losses

Transformer losses will during tender evaluation be evaluated based on the followingfigures (ref Bid data Sheet):

Load losses:	USD 1070/kW for 25Years
No load losses:	USD 4300/kW for 25 years

If nothing other is specified in Scope of Work, Load losses will be evaluated based onthe **ONAF** rating for transformer with combined ONAN/ONAF cooling. The Bidder must submit losses in the Guarantee Schedules without tolerances.

4.8.1.2.16 Transformer Drawings

The following shall be included with the Bid:

(Note: if complete design drawings are not available, drawings should be submitted ofan existing design equivalent in all essential detail to that being offered).

a. Dimensioned outline drawings of the transformer and any auxiliary plant showing:

- The arrangement and position of all fittings and accessories.
- Any section to be removed for shipment and their separate dimensions and weights.
- Principal dimensions and minimum clearances (phase/phase and phase/earth).
- Weight, sling angles and height from ground level to crane hook applicable forlifting:
- The tank cover
- The complete transformer
- The cores and coils out of the tank
- Position and function of all valves.
- Position and function of all access openings.
- Total weight and distribution of weight to enable foundations to be designed (to bedesigned by the Employer).

b. Drawings showing the arrangement of the core and windings including coreclamping arrangement.

c. Detailed drawings of the tapping switch showing internal details of switch andmechanism, tapping connections and change-over link board.

d. Fully dimensioned drawings of all proposed bushings including cross-sections andfull electrical characteristics.

e. Schematic wiring diagrams of automatic voltage control, cooler control, andprotection systems with fully detailed description of the operation.

- Drawings of proposed rating and diagram plates.

f. Catalogues of all accessory equipment and fittings.

4.8.1.3 Distribution and Auxiliary Transformers

4.8.1.3.1 General

This specification covers the manufacture; testing, supply and delivery of pole mounted distribution type transformer and spares for the substation auxiliary supply.

4.8.1.3.2 General Design

Transformer shall be of the mineral oil immersed "core" (wound core or shell type shall not be provided) type suitable for outdoor use with Oil Natural Air Natural (ONAN) cooling. Primary and secondary bushings shall be located on top cover

Transformer shall be designed to deliver full rated power continuously on any tappingwithin the specified tapping range under the following conditions: -

i) With the voltage of the untapped winding at rated value, without the need to de-rate the transformer at the extreme tap positions and without exceeding IECtemperature limits.

ii) With voltage applied up to 10% in excess of the rated tapping voltages and without injurious overheating.

Transformer shall be connected in accordance with IEC 60076 or equivalent: three phase transformers to Vector Group reference Dynll.

All L.V. neutrals shall be brought out of the tank to a readily accessible terminal and shall not be earthed inside the tank, unless otherwise specified in the enquiry.

Transformer on a particular contract with similar voltage ratios and connections shallbe suitable for parallel operations on all relevant taps under which conditions they should share the load in proportion to their ratings subject to the tolerances on impedance laid down in IEC 60076.

Low impedance transformers are preferred, a maximum of 5% being envisaged on anysize with no plus tolerance.

When requested in the enquiry, sealed designs shall be offered and the following details shall apply:

i) Unless otherwise approved, sealing shall be effected by means of a bolted coverdesign employing nonstandard bolts on the top cover (keys shall be supplied for each transformer).

ii) Any holes or plugs used to facilitate vacuum/pressure testing, leak testing or oil filling of the transformer shall finally be sealed by welding.

iii) The expansion of the oil level shall be accommodated by the tank itself (i.e. nogas filled pillow will be accepted). The bidder must submit documentation showing tests simulating 40 years of expansion and contraction of the tank without impairment of the rib welding.

An oil level gauge shall be provided.

Pressure valves, pressure/vacuum gauges, non-return valves and drain valves shall notbe fitted.
Earth stud required at both H.V. and L.V. ends of transformer.

The transformer shall operate without undue noise and every care shall be taken in thedesign and manufacture to reduce noise to the level of that obtained in good modern practice. The noise level of the transformer shall not exceed 60dB (A) when tested in accordance with IEC Publication 60551.

4.8.1.3.2.1 Windings

Tapping shall be provided in the H.V. windings, preferably in the centre of the windings, to permit variation of the number of H.V. turns without significant variationin the kVA rating. The variations shall be effected by means of a manually operated tapping switch to be provided.

The HV windings shall be made from grade 3 enamelled copper wires, whereas LV windings shall be made from copper foil/strips. Graded windings insulation and Aluminium windings shall not be accepted for this project.

All windings and terminations shall be fully insulated and those for service above 1000 volts shall be designed for impulse voltage tests. Conductor material shall be cupper. No foil windings shall be used.

Designs shall be such that electrical stresses are as uniform as possible throughout thewindings under impulse conditions.

Windings shall be vacuum impregnated and insulating materials shall not be liable tosoften, shrink, become brittle, carbonise, deteriorate, or collapse in any way during service.

4.8.1.3.2.2 Cores

The magnetic circuit shall be earthed to the core clamping structure, at one point only,and the core assembly to the tank. Where transformers are not sealed readilyaccessible removable bolted links shall be employed for the earthing connections.

The general construction of the cores, framework and the clamping arrangements shallbe robust and such that they will be capable of withstanding completely any stresses which may occur due to handling, transport or service. All cores and yokes shall be terminated and clamped by means of a suitable framework. Suitable means shall be provided for lifting the cores from the tanks.

It shall not be possible for the core to move relative to the tank during handling or transport.

The core shall be made from high permeability material (CRGO) Class C.22 grain-oriented steel laminations.

4.8.1.3.2.3 Tapping Switches

The transformer shall be provided with approved off-circuit type tap changing equipment. Tapping ranges shall be ± 2 x 2.5% with a maximum of 5 tap positions.

A fully insulated off-circuit, externally manually operated ganged tapping switch shallbe supplied, capable of withstanding the specified impulse voltage when connected tothe transformer windings.

Clearly visible tap position indication shall be provided. The tapping switch shall be operated by means of an external handle that can be positively located and locked in each operating position.

The switch shall be mechanically robust and provided with a device between the handle and the switch to permit operation without strain in the event of imperfect alignment between switch and handle; the switch operating shaft shall be fullyinsulated as between tank and switch and shall be provided with a suitable oil and vacuum tight gland where it passes through the tank.

The use of wood shall be avoided wherever possible and all the supports and terminalboards shall be completely unaffected by hot oil and non-moisture absorbent.

High-grade insulating materials shall be used in the construction of tapping switches which shall be designed with special attention to the elimination of points where tracking is likely to occur.

Tapping switches shall be mounted on supports made of suitable high strength insulating material and shall be provided with self-aligning spring-loaded wiping contacts capable of maintaining good electrical contact without the need for periodic maintenance.

All clearances between tapping switch contacts and leads shall be indicated ondrawings submitted at the time of Bidding and such clearances shall be sufficient to prevent tracking or flashover in the event of carbon or sludge deposits forming on leakage paths.

H.V. tapping: Minus 2.5% - 0% - Plus 2.5% - Plus 5% - Plus 7.5%.

4.8.1.3.2.4 Outdoor Bushings

All line terminals and neutral connections where specified, shall be brought out to porcelain outdoor type terminal bushings in accordance with DIN 4253 with minimumcreepage distance 31mm/kV in Coast and industrial area and 25mm7kV in inland installations. Arcing horns shall be fitted on all transformer bushings. As an alternativefactory mounted surge arresters are acceptable.

4.8.1.3.3 Tanks and Conservators

4.8.1.3.3.1 General

Drain valves may be either screwed or flanged whilst conservator isolating valves shallbe flanged. Drain valves shall be complete with captive plugs that shall be either of non-ferrous metal or galvanised.

All internal steel surfaces or tanks and conservators shall be shot blasted and cleaned,and a coat of protecting compound, unaffected by hot oil, should be applied.

All external surfaces and parts made of steel are to be thoroughly shot blasted and cleaned, after which two coats of priming paint, preferably of zinc chromate, one intermediate coat and one coat of finishing paint are to be applied. The Project Manager shall approve the colour.

Transformers on which the paints are found to flake off or deteriorate within the guaranteed period shall be suitably cleaned and repainted free of charge by the supplier.

4.8.1.3.3.2 Tanks

Each transformer shall be housed in a tank of welded steel plate construction suitablystiffened where necessary but with a flat base. Wheels or rollers are not required.

Each tank shall be provided with the accessories specified Table 1, the lifting lugs called for shall be suitable for lifting the transformer bodily by means of a hoist or crane when it is completely assembled and ready for service.

All transformers shall be provided with four fixing lugs on the base drilled with 15 mm holes for bolting to a platform. The fixing holes shall project beyond the ends of the tank and be placed to provide the most practical stable arrangement.

No radiators or tube coolers shall be used ribbed tanks shall, if needed, be supplied in order to achieve the necessary cooling under the conditions prevailing at site.

4.8.1.3.3.3 Conservators

Conservators shall be of dimensions such that oil expansion may occur over the working range temperature from no load with the transformer cold at minus 5°C ambient air temperature to full load at plus 45°C ambient air temperature while the sump pipe remains covered and the oil level is visible or indicated.

The fittings detailed in Table 1, shall be provided on all transformer conservators.

Drain plugs shall preferably incorporate approved sampling facilities, and shall be mounted at the lowest part of the conservator tank and so designed that the sampling device can be readily cleared in the event of its being blocked by an accumulation of sludge etc., without the necessity of having to dismantle the device completely.

Oil level gauges on conservator tanks shall be of the refracting plate glass or other approved type, marked with the level at 20°C at no-load and capable of indicating thelevel of oil over the specified working range.

Where dehydrating breathers are specified, they shall be of the Silica gel type (cobalt free), in accordance with DIN 42567, which give indication of moisture absorption bychange in colour of the charge. The breather shall be covered by a metal tube to avoidvandalism. An inspection window shall be provided and mounted in a position convenient for inspection. The breather is to incorporate an oil seal to prevent contact with the external air when breathing is not taking place. The breather shall be fitted on the L.V. end of the transformer.

Where only a vent pipe without a breaker and incorporating a filling hole is specified,it shall preferably be fitted with a cap and provided with very fine mesh in corrodibleanti-vermin gauze.

4.8.1.3.3.4 Accessories and Fittings

All transformers shall be provided with accessories and fittings in accordance with Table 1, unless otherwise specified in the enquiry.

Rating and diagram plates shall be engraved steel, brass or other approved in corrodible material.

Where a thermometer pocket is provided, it shall be of a thin-walled metal mounted inthe tank cover.

The pocket shall project 25mm outside of the tank and shall be threaded along the whole projecting portion, a screwed cap shall be provided to cover the pocket when not in use.

Lightning arresters equipped with galvanised brackets suitable for bolting to a verticalsurface shall be mounted directly on to the transformer tank. The mounting surface shall be such that the centre lines of the arresters are parallel with the centre lines of the associated bushings, and at the same spacing as the bushings.

Table 1: Accessories and Fittings for distribution transformers

Item No.	15 - 315 kVA
Transformer Tank Fittings	
1. Conservator (Sealed type)	N
2. Drain valve with captive sealing plug	N
3. Lifting lugs	Y
4. Thermometer Pocket	N
5. Rating and diagram plate	Y
6. Hanger irons	N
7. Platform mounting lugs	Y
8. Earthing Terminal	Y
9. Lightning arrester brackets	Y
10 Arching Horns	Y
11. HV Lightning Arrestors	Y
11.Dial type thermometer	N
12 Jacking pads	1000 Kg or more transformer mass
13.Oil gauge	Y
14. Pressure relief device	Y
15.Lashing down facilities	Y
16.Marshalling box for Item 10 of Tank fittings and Item 7 of Conservator fittings	N
Conservator Fittings	
1. Drain plug	Y
2. Sampler	Y
3. Separate filling hole with cap.	Y
4. Dehydrating breather	Y
5. Plain breather	N
6. Oil gauge	Y
7. Gas & oil actuated relay	N
8. Conservator isolating valve	N

Y = Required **N = Not Required**

4.8.1.3.3.5 Insulating Oil

The transformer shall be filled with low viscosity mineral insulating oil, whichcomplies in every respect with the provision of IEC 60296.

4.8.1.3.4 Tests

The following tests shall be carried out:

a) Routine covering test certificates shall be submitted, immediately after completion of tests in the factory, for each and every transformer.

b) As a type test, temperature rises test on each different rating of transformer.

c) As a special test, an impulse voltage withstands test including chopped waves oneach different rating of transformer.

Note:
If tests to b) and c) above have been carried out satisfactory on designs identical in allessential details, these tests may be waived on the production of acceptable covering test certificates.

4.8.1.3.5 Packing and Transport

Transformer shall be transported to destination with their tanks full of oil up to the service level.

Bushings and any accessories or fittings likely to be damaged shall be protected adequately against damage in transit.

4.8.1.3.6 Transformer drawings and diagrams

4.8.1.3.6.1 To be submitted with Bid

The following drawings shall be supplied with any Bid unless identical drawings havebeen previously supplied, in which case a statement in the Bid of the applicable drawing subjects, numbers and revisions will suffice together with details of the references under which previous supply was made:

General arrangement drawing of each rating of transformer offered showing:-

i) Minimum clearance (phase to phase and phase to earth) on H.V. and L.V.bushings including clearance H.V. to L.V.
ii) Positions and identification in a separate legend of all fittings with type numbers.
iii) Size and position of all fixing holes.
iv) Total weights with and without oil and core lifting height and weight.

Detail dimensioned drawings of tapping switch illustrating type of material,clearances, between tapping points and to earth and method of operation.

Detailed dimensioned drawing of bushings, silica gel or plain oil seal type breather,and conservator.

Note:
Where sealed transformers are offered, a cross arrangement drawing shall be submittedwith the Bid showing, in particular, details of the tank construction and internal tank finish and the depth of the expansion space above the oil.

4.8.1.3.6.2 To be submitted with Contract

Latest issues of the drawing shall be supplied under the contract; if no modifications are applicable to the drawings supplied with the Bid, this shall be confirmed in writingunder the contract and further drawings need not be supplied.

Rating and diagram plate drawing shall be supplied.

4.8.1.3.7 Evaluation of Losses

The loss evaluation/ capitalisation shall be as for the main/Power transformers

PARTICULAR TECHNICAL SPECIFICATIONS

FOR

SUBSTATION AUTOMATION, CONTROL AND PROTECTION

TABLE OF CONTENT

5 Substations Automation, Control and protection

5.1 Control, Protection and Metering

General

The sections below cover the technical requirements for the systems of control, protection, metering and signalling of the sub-stations. The control and relay boards shall include all equipment as specified in Scope of Works, needed for complete installations. Any computer solution proposed shall be based on hardware and software well proven in HV installations. All data storage media shall be checked for internal faults and virus before delivery.

The supplied and installed instruments, relays, switches and other equipment shall properly match the equipment to which it shall be connected, and which is included in the sections dealing with the different types of switchgear for transformers, transmission lines and other items.

The complete and detailed scheme of control, protection, alarms, etc., shall be proposed by the Contractor for each individual sub-station project. In this detailed planning the Contractor shall carefully consider the future extension of the plants. The Bidder shall guarantee the availability of spares in 10 years from cessation of normal production. This shall be demonstrated in the bid

The control, metering and protection equipment can be placed in common panels but not as integrated functions. The panels shall not be unnecessarily crowded but have space for moderate extensions. All control functions and status indications shall be clearly arranged in a mimic diagram. The bay control unit shall have a mimic diagram for all the equipment in the bay. The equipment shall be on a modular basis connected to terminals inside the panels and easy to replace. For indoor MV switchgear the control and protection can be located in the instrument compartment in the switchboard.

All data and parameters specified to the individual distributed control units, shall be stored in a non-volatile memory so no local logic or information will be lost due to power supply failure.

5.2 Overview of Substation Automation System - SAS

This Substation Automation System (SAS) comprises full station and bay protection as well as control, monitoring and communication functions and provides all functions required for the safe and reliable operation of the substations.

It shall enable local station control via a Personal Computer (PC) by means of a human machine interface (HMI) and control software package, which shall contain an extensive range of system control and data acquisition (SCADA) functions. It shall include communication gateway, inter-bay bus, intelligent electronic devices (IED) for bay control and protection.

The communication gateway shall secure the information flow with Regional Control Centres. The inter-bay bus shall provide independent station-to-bay and bay-to-bay data exchange. The bay level intelligent electronic devices (IED) for protection and control shall provide the direct connection to the switchgear without the need of interposing components and perform control, protection, and monitoring functions.

In order to meet the requirements of this specification the detailed design of the SA is within the manufacturer's responsibility, but subject to approval by . This specification covers the design, manufacture, and inspection, training and testing at the manufacturer's premises and at site, delivery to site, installation, testing and commissioning.

5.3 Design of SAS

The Substation Automation System (SAS) shall be suitable for operation and maintenance of the complete substation including future extensions. The offered products shall be suitable for efficient and reliable operation of outdoor or indoor substationsfor distribution and transmission.

The systems shall be of the state-of-the art based on IEC61850-3-2013 and IEC60870-104 for operation under industrial conditions present in high-voltage substations, follow the latest engineering practice, and ensure long-term compatibility requirements and continuity of equipment supply and the safety of the operating staff.

The offered SAS shall support remote control and monitoring from Regional Control Centre via gateways.

The system shall be designed such that personnel without any background knowledge in microprocessor-based technology are able to operate the system easily after having received some basic training.

Cubicles shall incorporate the control, monitoring and protection functions specified, self-monitoring, signalling and testing facilities, measuring as well as memory functions, event recording and disturbance recording. The basic control functions are tobe derived from a modular standardized and type-tested software library.

For safety and availability reasons the Substation Automation System shall be based on a decentralized architecture and on a concept of bay-oriented, distributed intelligence.

Functions shall be decentralized, object-oriented and located as close as possible to theprocess. The main process information of the station shall be stored in distributed databases.

5.4 Typical SAS architecture for substation

The typical SAS layout shall be structured in two levels, i.e. in a station and a bay level.

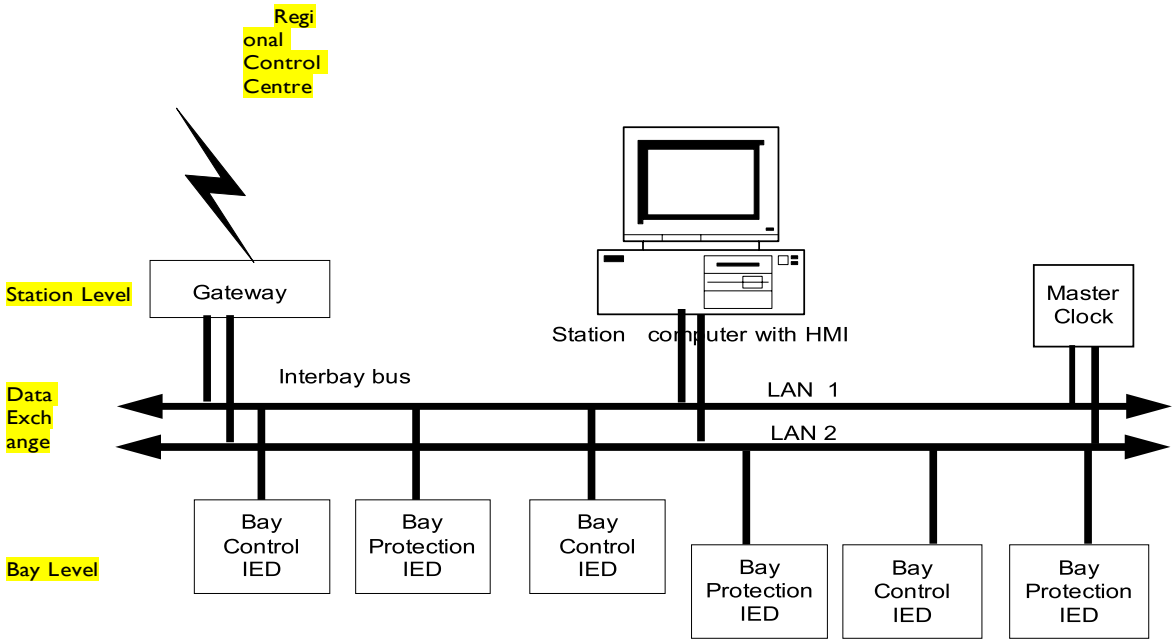
The system shall accommodate control, data acquisition, alarm handling and trend analysis. The figure below illustrates the main principles. However, the Employer wantsto keep a conventional back up control facility with indication at bay level (local control). I.e. control of motorised breakers and switches, status indication of all breakersand switches, analogue or digital indication of measurands (I and I_{max} all phases, MW and MVAr) and alarm annunciation shall be presented by discrete components.

The control of high and medium voltage circuit breakers, isolating switches and tap changers shall take place in a hierarchy with four levels as described in Project SpecificData Section. From each level one may block access from higher levels:

The control units shall take auxiliary voltage form the station battery and be equippedwith self-supervision systems giving alarm by internal faults.

The system shall be fail-safe keeping all equipment in the last status by loss of communication to higher systems.

The Gateway and Station Industrial Computers shall be housed in panels while the HMImonitors shall be installed in the substation control room/office.



System Architecture of Substation Automation

At bay level, the IEDs shall provide all bay level functions regarding control, monitoring and protection, inputs for status indication and outputs for commands. The IEDs should be directly connected to the switchgear without any need for additional interposition ortransducers.

Each bay control IED shall be independent from each other and its functioning shall not beaffected by any fault occurring in any of the other bay control units of the station.

The data exchange between the electronic devices on bay and station level shall take place via the inter-bay bus. The bus shall be realized using fibre-optic cables or Ethernet.

At station level, the entire station shall be controlled and supervised from the station HMI. It shall be possible to control and monitor the bay from the bay level equipment, in the event that the communication link fails. The station wide interlocking shall also be available whenthe station computer fails.

To provide highest reliability the station HMI and the gateways shall work completely independent meaning retrieving the process data directly from the bay level devices.

Additionally, the gateway and the station HMI shall be configured fully redundant to ensurefull functionality in case of single point of failure.

Clear control priorities shall prevent that operation of a single switch can be initiated at thesame time from more than one of the various control levels, i.e. SCADA, station, bay levelor apparatus level. The priority shall always be on the lowest enabled control level.

The station level contains the station-oriented functions, which cannot be realised at bay level, e.g. alarm list or event list related to the entire substation, gateway for the communication with remote control centres.

A dedicated master clock for the synchronization of the entire system shall be provided. Thismaster clock should be independent of the station computer and of the gateway, and shouldsynchronize all devices via the inter-bay bus.

The SAS shall contain the following main functional parts:

(i) Human Machine Interface (HMI) with process database
(ii) Separate gateway for remote supervisory control via SCADA
(iii) Hot Standby Gateways for stations with transformation capacity of 23MVA andabove.
(iv) Master clock (GPS receiver)
(v) Collection of the relevant data concerning the substation and distribution of the datawhere needed
(vi) Bay and station level devices for control, monitoring and protection
(vii) Bay-oriented local control and protection panels.

5.5 Signal List

The signal list shall be agreed between the KAA, and the Supplier and shall comprise the following;

- Commands for all Circuit Breakers and motorized switchgear
- Status Indications
- Alarms and Trips
- Set Point regulation
- Measurands
- Energy meter readings
- Reset by SCADA for all Master Trip Relays

The design shall include mapping of the Signal list from the supplier (as addressed & used inthe HMI) to the requirements of the Regional Control Centre (supervisory level) signal requirements.

The design of the SAS system shall include the following;

- Control mode selection
- Select-before-execute principle
- Command supervision: Interlocking and blocking

- Double command Auto reclosing
- Monitoring pole discrepancy and trip function
- Transformer tap changer control
- Display of interlocking and blocking
- Breaker position indication
- Alarm annunciation
- Measurement display
- Local HMI (local guided, emergency mode)
- Data storage for at least 200 events

5.6 Select-before-execute

For safety reasons the command is always given in two stages: selection of the object and command for operation.

These two commands are realized with one contact each; only when both contacts are closed, is the final command (open or close) executed.

5.7 Station HMI

The operator station HMI shall provide basic functions for supervision and control of the substation. The operator shall give commands to the switchgear on the screen via mouse clickson soft-keys.

The HMI shall give the operator access to alarms and events displayed on the screen. Aside from these lists on the screen, there shall be a printout of alarms or events in an event log.

An acoustic alarm shall indicate abnormalities, and all unacknowledged alarms shall be accessible from any screen selected by the operator.

SAS shall include the following displays &functions:

- Control of all switching devices
- Real time indication of status, alarms and devices
- Display of measured values, high/low limit checking.
- Indication of real and historical values
- Data Archiving
- Disturbance Monitoring and analysis
- Trend display facilities
- Protection device information
- Remote access to SAS from the Control Centre via the SCADA system
- Remote communications
- Indication of automatic tap changer relay status
- Manual local and remote setting of tap changer relay
- Self-check & diagnostic: These functions are essential for system operation
- Safety and easy maintenance.

Manual data setting (can be performed by the operator) using the following functions:

- Device status setting
- Analogue data setting
- Control inhibit setting
- Alarm inhibit setting

- Maintenance tag setting
- High/Low limit setting
- Protection relay parameter setting, etc.

- Also, all required signals related to the control, status indications and monitoring ofthe switchgear and other relevant equipment shall be provided to the SAS.
- Time Tagging

The configuration of the station HMI shall be made using the operator station in the Windows environment. The various functionalities shall be customized by easy-to-use interactive configuration tools. The configuration shall include the visual presentation of theobject, adaptations needed in the process database, and adaptations of the communication configuration data.

5.8 SAS Equipment

All SAS equipment shall be of industrial type conforming to IEC 61850-3-2013 standards

5.8.1 Substation Computer

The substation computer coordinates the operation of the SAS. The functionality shallinclude:

- Alarm Grouping
- Event Logging
- SAS Management software
- The substation master control shall be capable of automatic restart in the event ofpower failure
- Without loss of functionality or local database. It shall be readily possible to updatethe substation
- Computer software to alter or extend the SAS functionality. The Tenderer shallstate how this is achieved.

5.8.2 Substation Local Area Network

Local substation communications shall use Ethernet LAN to connect the components of theSAS using open international IEC 61850 GOOSE protocol. The LAN may be of star-couplerconfiguration. Fibre optic can be used only in instances where the lengths are too long to behandled by Ethernet LANS. No single point of failure of the substation LAN shall result in any loss of substation control functionality.

The station controller must be able to receive and transmit information from future extensions on an IEC 61850 protocol.

5.8.3 Operator Workstation

- The Operator workstations / HMIs shall consist of high-performance computer andmonitor with computer desk. It shall be fully integrated into the SAS on the substation LAN. The proposed HMI shall be based on the latest PC technology available on the market at the time of offering.
- The operator desk and chair shall be of high-quality construction, appropriate to continuous use by the operator.

5.8.4 Printers

- Two high performance printers shall be provided, each capable of connection tothe substation LAN.
- 1 off Matrix printer Logger, for events and for operator log.
- 1 off Colour Printer to print screen shots or other information

5.8.5 Satellite Clock

- Time synchronization and event time tagging with resolution of at least 1ms shall be provided by a satellite GPS clock signal as the Master clock, the secondary clockshall be provided via the SCADA system.

5.8.6 Audible Alarm

- One common sounder should be provided to give at least two distinct audible alarms in case of alarms/faults or events.
- The sounder shall be configurable according to the event type and to the control status of the SAS (Local/Remote). An auto-silencing scheme shall be provided forthe alarm and the sounder shall be controlled by distinctly labeled "Audible alarmON/OFF" control switch.
- The complete unit may be mounted in suitable relay/control panel.

5.8.7 Common Bay Unit

- The Common Bay Unit (CBU) shall be provided for monitoring of commonservices. The CBU shall be located in Control/Relay Room.

5.8.8 Data Transmission

- The SAS shall be able to communicate with the ABB type SCADA system usinga variety of open protocols. The RCC shall be capable of remote access to the SAS via the SCADA system. The protocols currently supported are IEC 61850-3-2013& IEC 60870-104.
- This communication link must be via an approved communication mode complete with the terminal equipment all supplied, installed & commissioned by the Contractor.

5.8.9 Cyber Security

The SAS system shall have protection against malicious, accidental and hackingattempts in accordance with applicable IEC standards.

5.9 Control Stations

5.9.1 Distributed Control Units

Outdoor switchgear shall have a control and relay panel in the control room with facilities for Local Control. The local control for indoor breakers can be located inthe instrument cabinet. The protection and control functions can also be combinedin one unit. Signals from protection equipment can alternatively be hardwired to baycontrol unit.

The Bay control unit shall handle position indications from Circuit Breakers, Disconnectors, Earthing switches and transformer tap changer. It shall control

closing and opening of circuit breakers and receive time tag, store and display alarms and measurements.

The position indication from the on-load tap changer shall be taken from apotentiometer switch supplied and mounted on the transformer.

The alarm handling capacity must be sufficient to handle all normal alarms from the switchgear, the protection, the transformer and the tap changer.

All commands from the remote and supervisory control can be given to bay controlunit, which execute the commands. Conventional interlocks should be retained.
All microprocessor-based control equipment such as bay control units shall be galvanic ally isolated from the environments outside panels, using opto couplers orinterposing relays for signals, galvanic isolated measuring transducers for measurements and relays or contactors for commands.

All data and parameters specified to the individual distributed control units, shall bestored in a non-volatile memory so no local logic or information will be lost due topower supply failure.

Editing and input of local data and parameters shall be performed locally by suitableprogramming equipment to be included in the supply. Preferably it should also bepossible to edit any such local data at higher control level and download this information.

5.9.2 Interface with Supervisory Control and Data Facilities

In order to interface and achieve the desired functionality of the SCADA/EMS system, data concentrators in substations shall be based on standard IEC 60870-104protocol.
The following SCADA facilities shall be available from the substation.

- Supervisory control of all circuit breakers and motorized line and bus bar isolators and remote control of on-load tap changers.
- Status Indications of all circuit breakers, isolators, positions of on-load tap changers and 'local/remote', 'Automatic/ Manual', Main/Follower mode of automatic voltage regulators where applicable. These shall be reported byexception, but system shall allow scan by demand.
- Alarms; Bay alarms, Transformer alarms, Bus bar alarms, station alarms and warning shall be collected by the SCADA.
- Measurements; bus bar voltages, frequency active & reactive power, 48 &110 V DC voltages and line currents.
- Energy measurements, this shall be at interconnection points and feeders.

Where data concentrators will capture and process data for transmission to the control centres it is expected that the following functions shall be provided:

- Single command outputs, double command outputs for supervisory (on/off) control of circuit breakers, isolators etc. with check-before-execute function.

- Regulation command outputs e.g. raise/lower command outputs for transformer tap changer control and set point transmission with validity check before execution.
- Resetting of Lock out Trip Relays on individual circuits.
- Single and double state digital inputs. Each status (open/closed) of two state devices such as circuit breakers or isolator position should be acquired independent from each other and checked for validity. Undefined states likeopen and closed or neither open nor closed shall be alarmed with run-timemonitoring adapted to the HV equipment operation parameters.
- Transformer tap changer position indication should be processed as codedsignals, by digital measurement input modules.
- Analogue measured inputs with pre-processing including validity check, local limit supervision and measurement transmission on exception (only ifa significant individually selectable change occurs).
- Measurement transmission with a resolution of at least 10 bit plus sign as this is the most economical way to increase the overall accuracy of the measurements.
- Metering pulse inputs for acquisition of energy values with internal storageto allow cyclic acquisition of meter readings.
- Sequential event recording with time stamping of events (time stamp 10ms,resolution 1 ms)
- Selectable priority levels for data acquisition to speed up the acquisition of circuit breaker status changes and important measurements.

5.10 Automatic Voltage Regulator

The transformer bay shall be equipped with an automatic voltage regulator acting on the on-load tap changer. The automatic voltage regulation function shall pursue tokeep a constant (but adjustable) voltage on the low voltage side of the transformer by raising or lowering the tap changer (however, an appropriate hysteresis shall be included to avoid over-frequent tapping). The regulation shall be achieved either bya freestanding relay or as a function in the control system.

If connected in parallel, in order to prevent circulating current or negative reactancesystem: the transformers shall be regulated in a master-slave mode, where each transformer can be selected as master. If the master transformer is out of service another transformer shall take over as master.

Manual switchover to conventional tap changing (local and remote) shall be accommodated.

Necessary blocking by out-of-range stepping (including inappropriate difference between parallel units) and disconnected transformer shall be included. The actualtap position shall be displayed locally and remote as

well as the identification of themaster unit.

5.11 Indicating and Metering Instruments, and Transducers

Remote indication of measurands shall take place on the station controller's VDU.Where local instruments are used, they shall be of the dial type which is easily legible, with black graduations and numerals on a white background. The instruments shall have a dimension of 96x96 mm. The error of the instruments shallbe maximum 1.5% reckoned on the total length of the scale. All instruments shall beof a narrow frame type.

Preferably the measurements shall be performed directly in the SAS or in the protection relays. However, if needed, the metering transducers (converters) shall be installed in the boards and shall be suitable for connection to the potential and currenttransformers. The cases shall be hermetically sealed against moisture and dust. Transducer output shall be an impressed DC current of 0-10 mA output. The maximum meter reading at the receiving end shall be equivalent to 30% overload ofthe source value. The permitted resistive load shall be at least 1000 Ohms. The accuracy class shall be minimum 1%. The auxiliary voltage, if required (preferablynot) shall be 48VDC.

The W and VAr measurements shall be of the three-element (three-wattmeter) type when connected to primary systems with grounded neutral. W and VAr measurements for transmission lines, shall be such that the direction of the power flow is indicated by negative direction towards the substation and positive directionout of the substation. The voltage shall be measured phase-phase voltage, one reading is sufficient.

The scale on the different types of instruments shall be proposed by the Contractorand be subject to approval by the Project Manager.

5.12 Factory Acceptance Test

The Control system with Station Control Unit and Field Units shall undergo a factory acceptance test where the total system is connected and all indications, measurementscommands and controls are simulated.

5.13 Training

An in-depth training in the application, fault finding and maintenance of the controlsystem shall be provided. The training must include but not be limited to the following:

- System configuration
- Programming tools
- Picture editing
- Operating system
- System maintenance
- Any other training regarded necessary by the Bidder
- Communication protocols, IEC 60870-103/104, IEC 61850-3-2013
- Protection device settings and configurations

5.14 Spare Parts and Tools

The Contractor shall furnish a list of recommended spare parts and test

equipment forthe purchased system to maintain reliable SAS operation. The spare parts list shall beshort-term spare parts that are necessary for two (2) years of operation.

These spare parts shall be included in the contract and shall comprise at least one spare module for supplied equipment and basic tools for system maintenance as provided for in the mandatory spares.

5.15 System Maintenance

Editing and input of local data and parameters shall be performed locally by suitable programming equipment to be included in the supply. Preferably it should also be possible to edit any such local data at higher control level and download this information. The programming equipment shall also be suitable for fault diagnostic.

- Laptop Computer for maintenance, information transfer and emergency HMI
- A Personal Computer (PC) as a service unit shall be foreseen for on-site modifications of the control and protection devices. This service unit shall be used for documentation, testing, commissioning & future maintenance work on the SAS.
- Licences for configuration of supplied equipment shall be in scope of supply.

5.16 Protection

5.16.1 General Requirements

The protection relays to be installed for the protection of 33 and 11distribution lines, transformers and other HV/MV equipment shall be Numerical type and support Communication protocols IEC 60870-5-103/104, Modbus and DNP3. Shall also support IEC 61850-9-2 GOOSE messaging. Relay shall be robust type, insensitive tochanges of temperature, vibration, etc.

Input from the measuring transformers shall be based on 1A, 110Vac. The relay's power supply must accept a rated operating voltage input range from 24-240VDC without the use of external resistors and without external reconnections and shall be designed to withstand the high voltage interference which is normally experienced in high voltageswitching stations.

There shall be galvanic isolation on all inputs and outputs including power supply input.Isolated opto inputs must accept a rated operating voltage from 24-240VDC/VAC without the use of external resistors and without external reconnections.

The Contractor shall endeavour to standardise the equipment by using as few differenttypes of instruments, relays, switches and other devices as possible.

5.16.2 Relay Construction and Mounting

The relays shall comply with the requirements of IEC 60255. Modular constructed equipment shall be tested as a complete assembly and details of such tests shall be agreed with the Project Manager when details of the construction are known. Constructional details shall satisfy the following

requirements as appropriate:

Relay contacts shall be suitable for making and breaking of the maximum currents which they require in normal service: The protective relays shall be provided with sufficient contacts for circuit breaker tripping. All protective relays, which initiate tripping, shall have not less than two independent pairs of contacts of which one shall operate the tripping relay or circuit breaker trip coil without the interposition of auxiliary contactors and without the use of reinforcing contactors.

A watchdog relay must detect internal fault including low auxiliary voltage. The auxiliary voltage supply to each discriminative relay unit shall be continuously monitored and an alarm shall be given whenever the voltage exceeds the limits for reliable protection operation.

The measured service currents and/or service voltages must be visible at the front display of the relay. In order to see all values at the same time, a four-line front display must be used. It shall also be possible to select default display.

The relay must store a record of the fault-trip values to facilitate post fault analysis including, such as currents, voltages, operating time identification of the faulted phase and faulted zone etc. The values must be available at the front display of the relay and transferable to the supervisory system. The storage must not be dependable of the auxiliary supply.

It must be possible to do all settings both from the relay front panel and/or with a PC through connection in the front panel of the relay

The relay must have a complete number keyboard in the front panel for settings and downloading of measured values on the front panel display

Wherever practicable the design of the relay schemes shall be based on the "fail-safe" principle. For example, care shall be taken to ensure that loss of DC supply or an open circuit does not cause incorrect opening or closing of circuit breaker. Circuit breaker or disconnector repeat relays should be of the on-latching type and a discrepancy alarm shall be provided to check correct operation of the relays following a circuit breaker or disconnector operation.

The lockout tripping relays shall be of the latching type and shall be hand and electrically reset.

In order to achieve a high degree of security in function, the protection system of each high voltage main component (lines, power transformers, shunt reactors, etc.) shall consist of two separated protection sets, main 1 and main 2 where applicable. Where two protection sets cover the same fault they shall be divided into two electrically and mechanically separate parts by means of:

- separated DC power supply,
- separated boards,
- separate current transformer cores,
- separate voltage circuits,
- separated tripping devices,
- separate tripping coils,

- separated cables,
- separated relay protection channels.

The restricted earth fault and differential functions for the transformers shall also followthe same principle for separation as outlined above.

The Auxiliary relays for protection trip shall have operating speed of less than 7millisecond.
Strict requirements shall be given on selectivity in isolation. Only the minimum possiblepart of the plant shall be tripped to isolate the fault or clear the abnormal conditions.
The Contractor shall for each substation carry out the protection plan for relay settings.The plan shall be submitted to the Project Manager for approval.

All necessary intermediate current and voltage transformers, converters and auxiliarypower supply units shall form part of the supply.

The user manuals must be user-friendly and divided into one general hardware and software description and one setting manual describing only the specified functions andnecessary settings for the different types of relays

5.16.3 Relay testing facilities

Each protection relay shall be provided with facilities for the connection of relay testing equipment. The facilities shall include plugs for connecting the testing equipment and switches for disconnecting the primary circuit of the relay, short circuiting current transformer circuits (make before break) and disconnecting the tripping circuit.

Programmable relays shall be delivered with software and software licences needed for testing, setting and reconfiguration of the relays. If hardware other than laptop is required for this such shall be included in the supply.

5.16.4 Fault Clearing Time

The protection system plus the circuit breakers shall have fault clearing time of not morethan 60ms for system voltages 132 kV and above and 100ms for lower system voltages.

5.16.5 Trip Circuits

All trip circuits shall be duplicated with one group tripping the circuit breaker directlyand the other routed via a trip relay with heavy duty contacts. All lockout trips shall berouted via a hand reset/electrical reset relay with heavy duty contacts. Closing of circuitbreakers from substation control systems or local operation cubicle shall be inhibited ifthe lockout trip relays are not reset.
The trip circuit supervision shall be independent ofthe protection relays and provided to monitor each pole of each trip circuit on circuit breakers with separate mechanism per pole with the circuit breaker in both the open. The status of the trip circuit shall be indicated on the panel.

An alarm shall be given to signal faulty trip circuits. The alarm shall be time delayed toprevent operation during momentary dips in the DC supply.

5.16.6 Fault Recorder and Fault Locators

Fault recorders and fault locators must be integrated in the line protection relays and usethe same input parameters as the main protection function. The fault locators must provide records for fault analysis in the "Standard Common Format for Transient Date Exchange (IEEE-COMTRADE)" Necessary signals from the transformers shall be included.

5.16.7 Supervision

The supply shall include hardware and software for remote setting, supervision and dataacquisition of the protection relays, fault locators and fault recorders. The software will be installed on a central PC with 'Windows' operating system. ThisPC will be shared with other Contractors. The centrally installed software shall make it possible to contact the relays over the telephone network via modems installed in eachsubstation. The Contractor shall supply and install the modems, connect the relays andtest the complete chain of control.

The protection relays shall also communicate with the bay control units over the openprotocol IEC 61850

5.17 Protection of HV System

5.17.1 66kV and 33kV Line Protection

Facilities shall be provided to enable one protection (main or backup) to be taken out of service for maintenance or testing without affecting the operation of the other in any way.The facilities shall include duplicate breaker trip coils, separately MCBs DC circuits andthe use of separate CT and VT windings. The protection relays shall be arranged to initiate a single set of auto-reclosing equipment.
The 33kV line protection schemes shall contain the following protection functions:

(i) Distance Protection function (Main)
(ii) Bay Control and Protection Unit (BCPU)
(iii) Three phase unidirectional over current and Earth fault function (Back)
(iv) Sensitive Earth fault function
(v) Auto reclose relay function
(vi) Trip circuit supervision visible from the front of the panel without having toopen the panel door.
(vii) Auto-reclose IN/OUT Switch
(viii) Breaker failure function

The distance and Overcurrent & Earth protection functions shall be in a separate relays/IEDs. Protection functions (iii, iv, v, vii and viii) shall be incorporated in BCPU asone IED

(a) <u>Numerical Distance Protection relay</u>

One complete distance relay with full scheme non-switched type for phase/earth and phase/phase faults and with up to four measuring zones. In addition to the above the numerical relays must have the following functions:

- Ratings: AC Inputs: 110VAC, 1Amp (three phase).
- Power Supply Voltage shall be universal 24-240VDC

- The relays shall be of Numerical design and supports communication protocols60870-5-103 and 61850
- The relay shall also have auto reclose function.
- Impedance criteria.
- Three zones phase –phase Protection.
- Three zones phase –earth Protection
- Additional Zone 4 Protection
- Automatic Switch on to fault.
- Independent settings for each zone.
- Distance to fault measurement.
- Display: On operation, the relay should display the faulted phase(s), time andzone of operation and distance to fault.
- Power Swing detection: Blocking/non-blocking selectable by user.
- Scheme communication logic and residual current compensating.
- IDMT Three Phase/Over current & Earth fault Protection.
- Fuse failure supervision.
- Auto- reclose logic 1phase and/or 3 phases.
- Three pole tripping logic.
- Disturbance and event records including software for disturbance analysis.
- Fault record should be incorporated.
- At least six (6) Binary inputs.
- Mho/Quadrilateral characteristics.
- Stability against Switching inrush currents and Reverse faults.
- Clear faulted phase indication.
- Clear fault identification even for boundary conditions.
- Software necessary for all above functions shall be provided.

All these functions must be integrated in a compact package and a user-friendly menudriven interface should be available to enable the setting and testing of the relays.
Three sets of Installation, Commissioning and maintenance manuals and settingssoftware shall be provided.

(b) <u>Three Phase Directional/Unidirectional Over Current & Earth Fault Relay</u>

Should incorporate the following functions:

- Ratings: AC Inputs: 110VAC, 1Amp (Three phase).
- Power Supply Voltage shall be universal 24-240VDC
- In addition of Overcurrent and Earth fault, the relay shall also have auto-reclose function
- Relay must be of Numerical design and supports communication protocols60870-5-103 and 61850-9-2
- Relay shall support remote on-screen Breaker opening and closing completewith a mimic for breaker status.
- Current setting range for over current relay 0.5In-2.4In
- Current setting range for earth fault relay 0.05In-0.8In
- Quadrature connection for polarising voltage (Vn=110)
- Applicable on the LV side of a Dyn1 transformer
- High set Element, with a setting range of 1-32In

- The phase and earth directional elements should be individually selectable.
- I.D.M.T characteristics according to BS142 or IEC60255 and Definite time characteristic
- The normal operating boundary shall be +/-90 degrees from relay characteristicangle Relay sensitivity should be 1% of rated value of current and current polarising voltage at an angle equal to the relay characteristic angle.
- Time setting multiplier 0.05 - 1.0
- Broken conductor protection feature
- Negative sequence Protection Feature
- High set Element for both over current and earth fault Protection, with a settingrange of 1-30In.
- Thermal Protection.
- Dedicated Breaker Fail Protection.
- Circuit Breaker Maintenance
- Incorporate Fault records, Event Records and disturbance records.
- Configurable output relays with ability to output starting elements to controlTripping of other upstream Protection relays.

Three sets of Installation, Commissioning and maintenance manuals and settingssoftware shall be provided.

(c) <u>Sensitive Earth Fault Relay.</u>

Should incorporate the following Features;

- Ratings: AC Inputs: 1Amp
- Power Supply Voltage shall be 110VDC or (Universal power supply of 24-240VDC is preferred).
- Relay must be of Numerical design and supports communication protocols60870-5-103 and 61850-9-2
- Current setting range for earth fault relay 0.005In-0.8In
- Definite time delay characteristic; setting range, 0- 30 Seconds.
- Circuit Breaker Maintenance
- Fault records, Event Records and disturbance records.
- Drop off /pickup ratio >90%
- Low transient overreach < 10%

Three sets of Installation, Commissioning and maintenance manuals and settingssoftware shall be provided.

(d) <u>Auto-reclose function</u>

- The auto-reclose function shall be enabled in the distance relay and in the overcurrent and earth fault rely, and there shall be no need of independent auto-reclose relay for 66kV lines and below.
- Selectable 1 - 3 auto-reclose shots
- Independent set dead time for each shot
- Auto-reclose inhibit after manual close
- Separate input for over current high set element and I.D.M.T element
- Auto-reclose inhibition for over current high set element.

For 33kv lines, the Three Overcurrent, Earth fault & Auto-reclose functions shall becombined in one IEDs (BCPU)

(e) Feeder Protection and Bay Control IED

The relay offered must have been in use in two other continents for at least 5 years andoffered satisfactory service.

The relay shall have the following functions and features: -

i. Relay must be of Numerical design and supports communication protocols 60870-5-103 and 61850-9-2

ii. Power Supply Voltage shall be 110VDC or (Universal power supply of 24- 240VDC is preferred).

iii. The relay shall be suitable for flush mounting

iv. The relay will have a large LCD screen measuring at least 7cm x 7cm where a mimic of the switchgear arrangement and status of the switchgear for the bay shall be displayed.

v. The position of the Circuit Breaker, i.e. racked-in or withdrawn shall be indicated.

vi. Circuit Breaker close and open push key buttons with symbols and colour codesas per the IEC standards shall be provided on the relay as well as switchgear selection key.

vii. A Local/Remote key selector switch shall be provided on the relay and the selectedstatus of the selector switch indicated by means of an LED.

viii. The Relay offered shall have at least the following protection functions; -

- Three Phase Overcurrent & Earth Fault
- Sensitive Earth fault
- Broken Conductor detection
- Autoreclose
- Circuit breaker contact wear
- Circuit breaker Failure protection
- Under and over frequency protection as well as rate of change of frequencyprotection
- Over/under voltage protection

Note:

- *All the protection functions shall meet the requirements of each function as includedin this specification.*
- *Earth Fault and Sensitive Earth Fault Protection elements shall be separate to allowindependent settings to be applied.*
- *Earth Fault and Sensitive earth fault shall have separate CT inputs.*
- *Detailed specifications for three phase overcurrent, earth fault and sensitive earthfault functions are included elsewhere in these specifications.*

ix. The relay shall have a circuit breaker contact wear counter/monitor.

x. The Relay shall measure and display (Metering) on the LCD screen following power system parameters; Current (I), Voltage (V), Active Power (P), Reactive Power (Q), Frequency (HZ) and power factor (P.F).

xi. The relay shall store at least twenty (20) fault records, Fifty (50) events and ten (10) disturbance records. The disturbance record shall have capacity to

monitor Eight (8) analogue and ten (10) digital channels.

xii. It shall be possible to display instantaneous measurands on the screen alongside the bay mimic.

xiii. The unit shall have an L.E.D to indicate relay healthy status (green colour) and relay faulty status (red colour). A separate Red L.E.D to indicate operation (Trip)of the protection functions.

xiv. The relay shall have at least Eight (8) programmable LEDs for displaying Protection function operations and other alarms.

xv. The template for writing the alarm labels shall be provided with the relay

xvi. The relay shall have at least twelve (12) binary inputs

xvii. The Relay shall have at least six (6) output relays

xviii. The relay shall be provided with IEC 61850-8-1 Communication protocol, and thecorresponding communication port.

xix. The Relay terminals shall be of screw type terminals large enough to accommodateat least 2x2.5mm2 cable and shall be located at the back of the relay.

xx. Front Serial RS232 or USB or Ethernet Port for relay communication with a laptop computer for relay configuration and parameter settings and download of fault records, events records and disturbance record for analysis.

Auto reclose relay function in the Feeder Protection IED.

The auto-reclose function shall be incorporated in the feeder protection relay and shall havethe following minimum features: -

i. Selectable 1-3 auto-reclose shots

ii. Independently set dead time for each shot

iii. Auto-reclose inhibit after manual close both from external CB close switch and from control key on the Relay front face.

iv. Each auto-reclose shot shall be initiated by the selected protection function(s). Operation of protection function not selected to initiate a particular shot ofauto-reclose shall lead to lock-out of the relay, hence circuit breaker.

v. Auto-reclose inhibition for over current high set element.

(f) Under frequency relay

Where required in 33kV bus each Bus bar shall be equipped with a separate under frequencyrelay for load shedding of all outgoing feeders. Each feeder trip circuit from the under-frequency relay shall be equipped with a clearly marked isolating link.

The relay shall be numeric having two independently time delayed settings in the range 50-47Hz with a resolution of 0.1Hz. The rate of change of frequency function shall be included.

(f) Bus bar Protection relay for 33kV and above Voltages

Bus bar protection schemes shall be provided at bus bars for voltages from 33kV and above. Low impedance schemes will be acceptable provided full bus bar protection coverage to include single phase and phase to phase faults can be achieved. The type of tripping criteriahas to be fully described and preference will be given to systems with at least two (2) criteriachecks before tripping.
Bus bar Protection relay shall have the following minimum and functional features:

i. Power Supply Voltage shall be 24-240VDC universal.
ii. Relay must be of Numerical design and supports communication protocols 60870-5-103 and 61850-9-2
iii. AC Inputs of 110VAC and 1Amps (In) 50Hz three phase per circuit.
iv. It should be able to carry 4xIn current continuously
v. Shall have extensive self-supervision and diagnostic facilities.
vi. Incorporate a check feature
vii. Incorporate continuous supervision for CT secondary circuits against any possible open circuit and if it occurs, shall render the relevant zone of protection inoperative and initiate alarm
viii. Be of phase segregated and triple pole type and provide independent zones ofprotection for each bus
ix. Provide 100% stability up to 50kA fault level and shall have immunity against systemtransients.
x. Be of high impedance, biased differential type and have operate and restraint characteristics with typical tripping time: 10 to 20ms
xi. The HMI should graphically display the bus bar configuration and the bus bar image and shall permit read out of a minimum of the following information:
xii. Phase currents (and optionally, phase voltages) in each bay
xiii. Differential currents in each Bus bar zone and each phase on line as well as at the timeof fault.
xiv. Alarm conditions and Trip conditions
xv. State of all the inputs and outputs setting values
xvi. Positions of the breakers in each bay
xvii. Resetting of output relays
xviii. Shall include Protection Enable / Disable feature
xix. Provide 100% stability up to 50kA fault level and shall have immunity against systemtransients
xx. It shall have sufficient number of programmable opto coupler binary inputs (Min of 10 No. per bay) and output relays with heavy duty & signalling contacts (Min of 10 No. per bay)
xxi. It shall include a Disturbance Recorder function
xxii. It shall include an Event Recorder function
xxiii. The Disturbance Recorder and Event Recorder buffer memory shall be of non-volatiletype and shall not require the use of batteries.
xxiv. Programmable LED indications.
xxv. The relay shall have front and rear communication ports for settings/configuration andintegrating with the local station automation or to a station monitoring system.
xxvi. One of the protocols offered for the communication port shall include IEC 61850.
xxvii. Time synchronization via IRIG-B and SNTP.
xxviii. Be supplied along with all suitable Original Customized licensed software

&communication cable for local and remote communications, analysis of fault etc.

xxix. The bus bar protection relay shall have built-in Breaker Failure feature.

xxx. The relay shall have CT supervision function.

There shall be trip command lockout with manual reset (local and by binary input.

(h) <u>Breaker fail Protection relay for 66kV and above Voltages</u>

Where an independent Circuit Breaker fail (CBF) protection relay is required shall be of thenumerical design and shall have following minimum features and functions: -

i. Power Supply Voltage shall be 24-240VDC universal
ii. Relay must be of Numerical design and supports communication protocols 60870-5-103and 61850-9-2
iii. AC Inputs of 1-Amps (In) 50Hz three phase per circuit.
iv. Relay should be able to carry 4xIn continuously.
v. Shall have extensive self-supervision and diagnostic facilities.
vi. Detection shall incorporate current check feature and a timing element.
vii. The current check function shall comply with IEC 60255-151 and timing element IEC60810-1.
viii. The relay shall have programmable initiating inputs and tripping outputs.
ix. It shall have sufficient number of programmable opt-coupler binary inputs (Min of 10No.) and output relays with high-speed heavy duty & signalling contacts (Min of 10 No.)
x. The HMI should permit read out of a minimum of the following information:
xi. Phase currents
xii. Alarm conditions and Trip conditions
xiii. State of all the inputs and outputs setting values
xiv. Resetting of output relays
xv. Shall include Protection Enable / Disable feature
xvi. It shall include a Disturbance Records, event record function
xvii. The Disturbance Recorder and Event Recorder buffer memory shall be of non-volatile type and shall not require the use of batteries.
xviii. Programmable LED indications.
xix. The relay shall have front and rear communication ports for settings/configuration and integrating with the local station automation or to a station monitoring system. One of the protocols offered for the communication port shall include international standard protocol IEC 61850. Time synchronization via IRIG-B and SNTP.
xx. Be supplied along with all suitable Original Customized licensed software & communication cable for local and remote communications, analysis of fault etc.

The breaker fail protection shall only isolate the bus bar to which the faulty breaker is connected

i.e. the station shall, as far as possible, remain in operation after a breaker failure. The bus bar protection can be used for selection of breakers to be tripped.

5.17.2 11kV Line Protection

- ☐ The main protection for 11kV lines shall be three phase Overcurrent & Earth

fault, over voltage and undervoltage and Sensitive earth fault combined in one IED/BCPU. The Auto-reclose function shall be incorporated in the Overcurrent &Earth fault relay.

- ☐ Very long 11kV lines shall require distance protection and shall be specified in the guaranteed technical specifications.
- ☐ The Overcurrent & Earth faulty, and Sensitive Earth fault relays shall have same features as described in clause 5.17.1 above.

The 11kV line protection shall also incorporate;

- ☐ Auxiliary relay to indicate/lockout circuit breaker for low SF6 gas pressure
- ☐ Trip circuit supervision relay that is visible from front of panel without having to openany panel compartment door.
- ☐ Front panel mounted Auto-reclose IN/OUT switch each relay is expected to interfacedirectly with a single mode optical fibre (OPGW).

Note: *Relay/IEDs should come with 20m fibre patch cords to connect with optical fibre cableat the ODF.*

Three sets of Installation, Commissioning and maintenance manuals and settings softwareshall be provided.

5.17.3 Transformer Protection 33/11 KV Transformers (HV Side)

The protection on HV side shall contain the following protection relays:

(i) Biased differential protection relay for two winding Transformer.
(ii) HV Three-Phase Over current & Earth fault Protection relay
(iii) Auxiliary relays in a annunciator IED for the following transformer functions

- Tx Buchholz gas
- Tx Buchholz surge
- OLTC Buchholz gas
- OLTC gas relay
- Pressure relief
- Winding temperature Alarm
- Winding temperature trip
- Oil temperature alarm
- Oil temperature trip
- Tx Oil level low
- OLTC Oil level low

(iv) Master trip for both HV and LV
(v) Trip circuit supervision relay for the HV breaker, visible from front of panelwithout opening relay compartment door.
(vi) Breaker fail protection

(a) Biased Differential Protection for a Two Winding Transformer

Overall differential protection equipped with over current stabilising for external faults and insensitive to in-rush current. The operating time of the IEDs (Protection relay) shall be less than 20ms. This is considered Main 1 transformer protection and shall incorporate thefollowing features:

- Ratings: AC Inputs: 1Amp
- Power Supply Voltage shall be 24-240VDC universal.
- Relay Must be of Numerical design and supports communication protocols 60870-5-103a-104 and 61850-9-2
- Pick up setting range, 0.1 to 0.5In
- Should incorporate a high-set Element with a setting range of up to 20In.
- Magnetising current inrush restraint
- Integral CT ratio compensation (0.1-2) and vector group compensation
- Measurement and indication on the MMI, of phase, differential and bias currents
- Storage of Fault records and Event records; the Fault flags should be accessible onthe relay LCD screen without opening the relay cover.
- Over fluxing restraint
- Over fluxing protection with Alarm and Trip functions
- 5th harmonic restraint feature on the differential Element.
- Appropriate Dual Bias characteristic to ensure relay stability
- Should incorporate a disturbance recorder feature.
- Red L.E.D to indicate Tripping
- Relay Self diagnostic and Alarm feature
- Ability to Latch output contacts to prevent TX re-energizing before carrying outinvestigations.

(b) <u>Three Phase Numeric IDMTL Over Current & Earth fault relay</u>

The IED shall incorporate the following Features;

- Ratings: AC Inputs: 1Amp
- Power Supply Voltage shall be 110VDC or universal supply 24-240Vdc.
- Relay must be of Numerical type and supports communication protocols 60870-5-103-104 and 61850-9-2
- Current setting range for over current relay 0.5In-2.4In
- Current setting range for earth fault relay 0.05In-0.8In
- I.D.M.T characteristics according to BS142 or IEC 60255 i.e. SI, VI, EI, LTI,including definite time for the high-set Elements.
- Time setting multiplier 0.05 - 1.0
- Broken conductor protection feature
- Negative sequence Protection Feature
- High-set Element for both over current and earth fault
- Protection, with a setting range of 1-30In.
- Thermal Protection
- Dedicated Breaker Fail Protection.
- Circuit Breaker Maintenance
- Fault records, Event Records and disturbance records.
- Configurable output relays with ability to output starting elements to controlTripping of other upstream Protection relays.
- Drop off /pickup ratio >90%
- Low transient overreach < 10%

15.17.4 Transformer Protection 33/11kV transformers (LV Side)

The protection requirement shall be as follows;

(i) Restricted earth Fault relay:
(ii) It shall include stabilising resistor and voltage dependent resistor (metrosil)
(iii) Sensitive Earth fault relay
(iv) Three phase over current & earth fault relay
(v) Trip circuit supervision relay for LV Circuit breaker that is visible

from front The characteristics of the Sensitive and Three phase Overcurrent & Earth faulty relaysshall be as described in the above clauses.

(a) <u>Restricted Earth Fault Relay</u>

The relay shall be used for protection of one winding of a power transformer, and shall have following minimum functions and features: -

i. Relay must be of Numerical type and supports communication protocols 60870-5-103-104 and 61850-9-2
ii. Ratings: AC Inputs: 1Amp
iii. Power Supply Voltage shall be 110vdv or 24-240VDC universal supply
iv. The Relay shall operate on high impedance principle.
v. The relay shall be suitable for flush mounting on panel front.
vi. The relay shall be of an independent relay and not a function in the differentialrelay.
vii. Relay shall reject harmonics produced by the system particularly thirdharmonics.
viii. Stabilizing resistor and voltage dependent resistor (metrosil) of suitable ratingshall be offered with the Relay based on maximum through Fault of 40kA.
ix. The relay current setting range shall be 0.05- 0.8 x rated current (In) as aminimum and an operating time < 25ms at 5 times the setting.
x. The relay shall have at least four (4) LEDs for relay status indication and for tripand alarms annunciation as a minimum and two (2) binary inputs as a minimum
xi. The relay shall have four (4) Binary Outputs as a minimum with LCD screenwhere the settings and measurands can be read
xii. The relay's REF operate current shall be displayed on the LCD screen and keypad for manual programming of settings and data access
xiii. The relay shall have serial RS232, USB or Ethernet Port for relay configurationand programming of parameter settings and data download using a laptopcomputer.
xiv. The relay shall have an event recorder with capacity to store the last fifty (50) events
xv. The relay shall have fault recorder with capacity to store the last ten (10) fault records

xvi. The relay shall have a disturbance record with capacity to store the last four (4) disturbance records

xvii. The relay terminals shall be screw type terminals large enough to accommodateat least 4mm^2 cable and shall be located at the back of the relay

xviii. Relay must be of Numerical type

xix. Relay should reject harmonics produced by C.T saturation

xx. The offer should include the associated stabilising resistor and voltage dependentresistor (metrosil)

xxi. Current setting range 0.05-0.8In

xxii. Operating time < 25ms at 5 times the setting

Restricted earth fault and differential protection functions shall be provided in separateIEDs.

Stabilizing Resistor

Each REF relay shall be supplied with an adjustable stabilizing resistor. For dimensioning of the stabilizing resistor consider maximum through fault phase–earth current of 25kA.

Restricted earth fault and differential protection functions shall be provided in separate units

Voltage Dependent Resistor (Metrosil)

Each REF relay shall be supplied with a voltage dependent resistor (VDR) or metrosil to limit voltage across the REF high impedance circuit.

The basis for the rated voltage of the VDR is the maximum phase-earth through fault of 25kA.

Note: *The Stabilizing resistor and the Voltage dependent resistor shall preferably be housed in a box with terminals that allow connection of the REF relay to the resistor and VDR in the box. Several terminals will be provided to allow selection of required stabilizing resistor. The single box will be suitable for panel mounting.*

Note: *The Protection Functions Offered shall satisfy the detailed specifications as included elsewhere in this specification for each of the protection and control functions.*

5.17.5 Bus Coupler - Bypass Trip Logic.

Where bus coupler is specified or already installed, the trip signals of any by passed circuitbreaker shall be instantaneously transferred to the bus coupler.

Electrical interlocks shall be provided to ensure that only one circuit can be put on bypassat any one time. This is only possible through the reserve bus bar.

The bus coupler protection shall in addition to possible bypass consist of a 3-pole IDMTLovercurrent relay and one IDMTL earth fault relay, all with standard inverse characteristicsas well as breaker failure back-up protection.

5.18 Relay test equipment

The relay test equipment shall be a portable three phase unit with facilities for testing of impedance relays, over current relays, negative sequence relays,

differential relays, earth fault relays both directional and non-directional as well as auto reclosing equipment.
All sources of test units shall be integrated in the unit digital display for volt and amps shall have 1% accuracy whereas the digital timer shall have a resolution not less than 1ms.It shall be possible to connect the unit to a personal computer and necessary software for data recording and data handling shall be included.

5.19 Relay Settings

The Contractor based on network and equipment requirements shall provide the protectionsetting.
The Contractor, prior to making all commissioning tests, shall apply the settings to theequipment.

5.20 Metering

All metering equipment shall meet the requirements in IEC 60687 and IEC 61036. Meters shall be designed for 110V±15/25%, 50(47-53) Hz and 1A secondaryvoltage/current from measuring transformers. Auxiliary supply for the meters shall be110Vac/50Hz from the voltage transformers, or 110VDC from the DC supply system.

5.21 Metering of 33 and 11kV Lines

Electronic meters for active power, reactive power (Wh and VArh) and data recording units shall be provided for each outgoing feeder for registration of power irrespective of the direction of power flow. The Whr meters and recorders shall be of class 0.2 and class 0.2 for the VArh. The scale on the different type of instruments shall be proposed by the Contractor and be subject to approval by the Project Manager. The meters shall be able tocommunicate with the control system with pulses and on an IEC 61850 protocol. The energy meters for all the circuits shall be house in one modular metering panel whosefront door is a transparent glass.

5.22 Synchronizing Equipment

Circuit breakers and the secondary side transformer circuit breakers at 66 kV and above shall have synchronism check equipment (controlled closure).
Closure of the circuit breaker shall only be possible when the phase angle, slip and voltage difference between the measured voltages are within pre-set ranges. Permitted phase angledifference shall be adjustable in the range of 5 to 100 degrees, the slip shall be adjustable in the range of 0.05 to 0.5% and the voltage difference shall be adjustable from 2 to 20%.

5.23 LV Cables and Cable Racks

General

This chapter covers the technical requirements of the external cables and appurtenance, cable laying, supply and erection of cable racks, etc., for all installations described under these Specifications except for the cables included in Domestic Installations (light, small power, etc.), which is described under Civil Works.
The supply and installation of the internal cables between the various parts of equipment shall be included in the Chapters in which the relevant equipment is specified.
The cable trenches including trench covers as well as conduits and cable racks

shall be furnished and installed by the Contractor. Other necessary materials and equipment for laying, fixing, terminating, etc. of the cables shall also be provided by the Contractor.
For calculation of the length of cables, cable racks, etc., the Bidder shall use the measurements computed from the Drawings. No alteration in the lump sum prices shall bemade due to possible rearrangement of any installation, changes in the building constructions, or any other reason, which may influence the quantity of cables and appurtenances to be supplied.
If, however, a considerable change in location of a switchyard should be made, the price shall be reduced or increased proportionally to the amount of reduction or increase in the distance between the switchyard and the control building. No price adjustment shall be madefor deviations of less than 25metres.

The cables shall be delivered in full lengths, and consequently no joints are permitted. Allaccessories shall be provided, such as potheads, galvanised and painted steel supports, clamps, etc.

5.23.1 Technical requirements - Cables

The design, manufacture, rating and testing of all cables shall comply with the provisions and requirements of the applicable IEC recommendations, supplemented by recognised national standards if necessary. 40°C maximum design ambient temperature shall be applied for all cables internally in the switchyard, between the switchyard equipment and the control building and inside the control building. All cables shall be of termite proof design, e.g. by brass tape or equal approved techniques.

Wherever the risk of inductively transferred disturbances during abnormal (short-circuit, earth fault) conditions as well as during normal conditions exists, the cables shall be screened.

In order to have a minimum number of types of cables, all cables shall be standardised as much as possible as regards cross-sections, number of cores and marking of cores.

The phase colour identification code to be applied shall be made known to the Contractorshortly after the award of the Contract.

For the three-phase low-voltage system, four wire grounded neutral system shall be used. The low voltage power cables (AC and DC) and all cables for control, measuring, etc., shallbe PVC insulated and PVC-sheathed with an earthed concentric copper screen. The conductors shall be of electrolytic copper. All cables shall be steel wire armoured. Further requirements are stated in General Specification of Works, "Wiring and TerminalBlocks".

5.23.2 Cable Laying

The main guidelines and general requirements for the cable laying are stated in GeneralSpecification of Works, Cable Laying and Routing.
Medium-voltage, low-voltage power cables and control and measuring cables shall besegregated from each other throughout the plant.

The cables shall be laid in an orderly manner and crossings in the same plane shall beavoided.
All cables shall be laid on cable racks where they are not running in cable ducts or

trenches,or in protecting tubes.

The cable racks shall be designed to allow the laying of the cable from the side(s) withoutpulling through. All racks and fixing devices shall be hot-dip galvanised.

The Contractor shall supply trenches and conduits of concrete.

The last section of a cable on the switchyard may be laid in a conduit or a pipe, they shall belaid in such a way that cables easily can be exchanged without digging.

5.23.3 Diagrams and Calculations

The Contractor shall deliver cabling plans and diagrams showing each cable connection. Drawings for the cable racks, fixing features, etc., shall also be provided by the Contractor.All dimensioning calculations shall be submitted to the Project Manager for approval.

The Bidder shall in his Bid give detailed information about the different types of cablesproposed.

5.23.4 Tests

Factory tests and site tests shall be performed in accordance with the applicable IECrecommendation.

Type test certificates shall be submitted on request.

5.24 Earthing (Grounding) System General

This chapter covers technical requirements of the earth electrode systems and the Earthingconductors for the connection of metallic parts, of lightning arresters and of the system neutrals, designed to protect persons and material and to allow for the correct service, operation and maintenance of the installations.

The substation earthing system shall be designed principally according to ANSI/IEEE 80-1986 Guide to Safety in AC Substation Grounding.
The Earthing system shall consist of the earth electrode system in the ground under the switchyard, and of the Earthing conductors, over-ground and in the buildings.

The Contractor shall design the complete Earthing system. He shall measure and verify the specific earth resistance at all places where Earthing electrodes will possibly be buried, heshall make drawings of the Earthing electrode grids, calculate the resulting earth electroderesistance, and supply all information about the planned Earthing electrode systems. He shallalso make drawings of the Earthing conductors, over ground and in the buildings and make the necessary calculations for the dimensioning of the Earthing conductor systems. All theabove shall be submitted to the Project Manager for approval.
For Biding purposes, the earth resistivity shall be taken as 2500 ohm-metres.

The contractor shall be responsible for providing and installing the underground Earthingsystem of the switchyard and for the connecting of all related equipment to this Earthing system and shall furnish all required materials for this purpose. The Earthing system shall earth operational electric systems of any type and

voltage such as transformer neutrals, lightning arresters, secondaries of instrument transformers, etc.

Moreover, the Contractor shall take the necessary measures and furnish the required material for the safe Earthing of:

- All steel structures, metal parts and overhead ground wires of the switchyard.
- All fences of the station, whereby for outer fences special care shall be taken to avoidinjurious step and touch voltages for personnel standing outside and inside these fences.
- All metal parts, even if these do not constitute a conducting part of an electric systemof the plants, such as machinery, operating desks, piping, sewers, rails, metal tanks,lighting, fixtures, cable racks, etc.
- All operational electric systems such as power and instrument transformers, lightning arresters etc.

All connections between equipment and the Earthing network shall be exposed (not embedded) and easily accessible for checking of the transition points. Bare conductors, aspart of the Earthing system, embedded directly in the concrete will not be accepted. Similarly, bolted connection of metallic constructions, do not form an acceptable Earthingconnection.

The layout drawings, the detailed calculations for the Earthing system and the relevant data, which the Contractor will use as basis for his design, shall be submitted to the ProjectManager for approval. The Contractor shall also be responsible for performing all measurements and final checking of the whole of the Earthing system.
Further requirements related to the Earthing system are specified in Particular Specifications.

5.24.1 Technical requirements

The Earthing system shall be constructed and installed to comply with the requirements oflocal regulations and of the applicable Standards.
More specifically and independent of (or in addition to) the regulations and standards, theEarthing system shall provide:

- Adequate protection for personnel against dangerous voltages, currents and arcs
- Safe touch voltages and step voltages
- A low Earthing impedance for the lightning arresters
- A low Earthing impedance for the transformer neutrals and a sufficiently low neutralconductor impedance
- Limitation of the induced, or capacitive transformed voltages on low voltage, low current and electronic cables, circuits, panels and other equipment.
- That short circuit, earth fault and double earth faults currents will flow through theEarthing systems and not through other conducting parts or building constructionsto a hazardous extent.

The maximum resistance of the earth electrode grid in the switchyard and under the controlbuilding shall be 0.5ohms during the dry period. In addition, the earth electrode system as well as all other Earthing systems shall be designed and constructed for the operating voltages, the design short circuit capacities and the corresponding short circuit and earth faultcurrents which are specified in General

Specification of Works, and in the other Sections ofthese Specifications for the respective voltage systems.

The overall resistance between the Earthing grid system and the surrounding soil shall be inthe range of 10 Ohms. If necessary, additional Earthing rods shall be applied to achieve thespecified value.

The dimensioning shall be co-ordinated with the relay protection scheme of the various partsof the plant. In any case, however, the Earthing conductors shall be dimensioned for carryingthe earth fault current and double earth fault currents of the various parts of the plant for atleast 1(one) second without any harm to the conductors or connections.
The conductors shall be reliably protected against mechanical damage and corrosion.

Buried connection shall be made by compressed clamps or by approved welding process. No bolted clamps may be used underground surface. Connections above earth shall be screwed and shall be easily accessible for control. All connections shall be protected againstcorrosion.

5.24.2 Earthing System under the Control Building

The conductors shall be of electrolytic copper with dimensions at least 30 x 3 mm for flatbar or at least 95mm^2 stranded wire. Copper-weld with approximately the same conductivitymay be used.

Risers shall be copper stranded bare earth wire at least 95mm^2.

The conductors shall be placed on the ground after the excavation is completed and just before the concreting starts. Care must be taken that the earth wire is in good contact withthe soil and preferably embedded into it.

Under the building the grid of conductors shall be placed with an average distance betweenconductors of not more than 10m. At all crossings the conductors shall be interconnected by brazing or welding. The grid shall also be connected to the concrete reinforcement at severalplaces as well as to the Earthing grid of the switchyard area. Vertical risers shall be brazedor welded to the conductors.

The risers shall be placed in the concrete shuttering, and led out of the shuttering at appropriate places approximately 30cm above the floors. Care shall be taken to protect therisers against damage during shuttering and concreting.

Connecting terminals for the screwed connections between the risers and the above-floor main Earthing conductors shall be placed at easily accessible places and protected againstmechanical damage.

The above information describes the minimum requirements. The final design and construction for the achievement of the total requirements of the earthing systems shall be made by the Contractor.

5.24.3 Earthing System for the Switchyard

The conductors shall be of electrolytic copper with dimensions at least 30 x 3 mm for the flatbar or at least 95mm^2 stranded wire. Copper-weld with approximately

the same conductivitymay be used.

The risers shall be of at least 95mm^2 stranded copper wire or equivalent copper-weld.

The conductors shall be placed forming a grid covering the whole switchyard area. The average distance between the conductors shall not be more than 20 m.

A conductor shall also be placed outside the fence along the whole length of the fence at a distance and at a depth suitable for the potential gradation needed to avoid dangerous touchvoltage between the fence and the ground.

Trenches for the Earthing grid shall be excavated in the ground to reach soil of good conductivity and a layer of at least 25cm of the same material shall be placed over the conductor. The conductor shall at no place be less than 80cm below the ground level.
Where advantageous for achieving low resistance to ground, vertical copper-weld Earthingrods may also be used, in addition to the horizontal grid.

Connecting terminals for the screwed connections between the risers and the on-ground Earthing conductors shall be placed in easily accessible locations.

The above information describes the minimum requirements. The final design and construction for the achievement of the total requirements of the Earthing system shall be made by the Contractor.

5.24.4 Earthing Conductors

In the control building a main Earthing bus shall be installed on each floor in the cable trenches.

The conductors for these main Earthing buses shall be of electrolytic copper with dimensionsof at least 95mm² for stranded conductor.

All the risers from the Earthing electrode systems shall be connected to these main buses bydisconnecting screw connections. At appropriate places at the end of the buses they shall be interconnected, thus to the greatest extent forming interconnected grids or loops.

Branch-offs to switchgear, panels and other parts, which shall be earthed, shall be of electrolytic copper with adequate dimensions for each item to be earthed.

Each item shall be directly connected to an Earthing conductor and not through a series connection of other metallic parts. Where rows of switchgear cubicles, boards and panels occur, each cubicle, board or panel shall be earthed individually.

The fence of the switchyard shall be earthed at distances of not more than 20 meters.

Earthing conductors for low current and electronic systems shall be insulated and shall be runfrom the systems, panels, etc., directly to a main Earthing bus close to a connection to the Earthing electrode system, These Earthing conductors shall not be mixed with the Earthingof the high power systems.

Earthing switches and lightning arresters shall have a riser directly connected to

the currentcarrying part in addition to a riser connected to the structure. All outdoor Earthing conductors shall be insulated with spacers or conduits against contact with galvanised steelstructures.

5.25 Site and Commissioning tests

General

Tests as described below shall be used as a guideline and may be changed or varied after written agreement from the Project Manager, due to changes of design manufacturing of construction techniques.

5.25.1 Test of Wiring

a. Insulation Resistance Test at 2.5kVac for one minute shall be carried out on all AC and DC Protection, control, alarm and indication circuit to ensure that wiringis in satisfactory condition. Ocular inspection shall be made on cable glands, cablejointing, fuse or circuit breaker ratings and small panel items, such as indicating lamps.
b. Static equipment which may be damaged by the application of test voltages shall have the appropriate terminals disconnected.
c. Inter-relay, inter-unit and cubicle wiring carried out at site is to be checked to theappropriate circuit and/or wiring diagram. This may be done by using bells or buzzers. D.C. supplied from the station battery may also be used. Where it is foundnecessary during re-commissioning work to effect site modification to the secondary wiring, site copies of the appropriate schematic and wiring diagrams shall be suitably marked as agreed with the Project Manager before the circuit is commissioned.
d. Loop resistance measurements are to be done and on all current transformer circuits. Separate values are required for current transformer and lead resistances and all measurements are to be recorded on lead resistance diagrams.
e. Pilot cable impedance and phase angle measurements shall be made when pilot cable is to be used with unit type protection. The Contractor providing the pilot cables shall measure these values.

5.25.2 Test of relays

a. All relays are to be examined to ensure that they are in proper working conditions and correctly adjusted, correctly labelled and that the relay case, cover, glass and gaskets are in good order.
b. Secondary injection shall be carried out on all a.c. relays, using voltage and currentof sinusoidal waveform and rated power frequency. For circulating current protection employing high impedance voltage setting test shall be across the relay and stabilising resistance. The operation setting for the type of protection is to be established by secondary injection, where it is not possible to ascertain this value.

5.25.3 Test of DC Circuits

Tests are to be carried out to prove the correctness of all DC polarities, the operating levelsof DC relays and the correct functioning of DC relay schemes, selection and control switching, indications and alarm.

5.25.4 Test of Instruments

Instruments and instrument transformer circuits shall be checked for polarity of direction and for calibration including any interposing transformers or transducers.

These checks shallbe made on all current transformer ratios where applicable.

5.25.5 Tests on Conductors, Insulators and Accessories

None required.

5.25.6 Tests on the Switchyard

All electrical equipment and installations shall be tested for correct connections of the high-voltage circuits and shall be subjected to a complete operation test to check the correct operation thereof in terms of the operational requirements specified in these specifications. The resistance to earth of the Earthing system of the switchyard shall be measured. The Earthing systems shall be checked for conductivity and reliable connections.

5.25.7 On Load test

On load tests are required, but due to the hazards inherent they shall be carried out under thedirect supervision of the Project Manager and/or the Employer. The following tests are required:

a. An operation and stability test shall be carried out for on-load commissioning.
b. Test for restraint shall be carried out to prove the characteristic of protective and measuring systems with directional characteristics.
c. On-load checks shall be made after the protective gear has been placed in serviceto ensure that all connections and test links have been replaced and test leads removed, as well as to confirm the integrity of the current transformer circuits. Where necessary, voltage readings shall be taken at the terminals on each relay toensure that loop connections between the relays are complete. Special attention shall be paid to broken delta voltages and residual current circuits were zero voltage or current respectively may not be proof of the completeness of the circuit.

PARTICULAR TECHNICAL SPECIFICATIONS

FOR

SUBSTATIONS CIVIL WORKS

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6. PARTICULAR SPECIFICATION- SUBSTATION CIVIL WORKS

6.1 General

6.1.1 Location of the Works

The locations of the sites are as described under the relevant clauses in scope of works in Volume IIbidding document.

6.1.1.2 Major Civil works in the scope

The major civil works to be carried out under this Contract includes but not limited to the followingactivities:

1. Transformer Plinth floor print shall be designed for 3.5MVA 33/11kV transformer minimum including associated works:
   - Transformer Oil interceptor tank and Burnt oil sump tank
2. Site Clearing and disposal from site
3. Switchgear / Control Building with a minimum floor area of 120 Sqr. meters
4. Switchyard civil works complete with Cabro internal roads
5. Platform works
   - Earthworks (Cut, Fill, Compaction and Area Grading)
   - Equipment Foundations (Reinforced Concrete Bases and Stub columns)
   - Internal Access Roads
   - Parking lot area and offloading bays to Kenya Roads Manual and Road designstandards
   - Water Supply System (and connection to nearby water supply authority withmetering)
   - Drainage (Area and Roof Storm water drainage, Subsoil drainage, Foul water/Sewerage Drainage including Septic Tank)
   - Subsoil drains, storm water drains and Septic tank
   - Rainwater Harvesting System
   - Ballasting/Platform Stone Layer of 100mm thickness
   - Site Restoration and Landscaping works
6. External Access Road (and associated Acceleration and Deceleration lanes)
7. Masonry boundary wall for Perimeter fencing for approx.1 acres of land
8. Reinforced Concrete Cable Trenches and Ducts
9. Guardhouse with Washroom facilities (gender separate and showers)
10. Erection and Commissioning of Substation equipment works
11. Lightning Protection and Switchyard Lighting works
12. Site Restoration and Landscaping works

Any other works necessary for full completeness of the project civil works scope

6.1.1.3 Switchgear/Control Building

2.5 MVA 33/11kV Substations

The Control Room building shall contain the following rooms:

- Switchgear room that can accommodate switchboard plus a space that would accommodate more feeder panels in the future.
- Control and protection Panel room to accommodate the necessary Protection and control panels and space for future expansion (one more bay for transformer and two for Line).
- Battery room (to accommodate both protection and communication batteries)
- Office room (3mX3m). Office furniture (document storage cabinets, key rack, chairs and office table) and kitchenette (with Cabinets, dish rack, oven cooktop and sink)
- Charger, DCDB and ACDB equipment room 3mX3m
- Minimum floor area for the control building is 120 square meters.
- 2 No. Toilet facilities and showers (2 No. VIP Pit Latrines as determined by PM)
- Electrical, Plumbing, Water Supply, Foul water Management, AC system and FireDetection and Suppression system

Appropriately place emergency doors for fire escape shall be provided in all Control Buildings

All the rooms shall be pressurized to avoid dust

6.1.1.1 Sequence of Construction

The Contractor must complete all the civil works in time to provide a clean and complete site for the mechanical and electrical erection.

The Contractor shall be responsible for timely delivery of materials to site and for compliance with the specified or agreed construction programme.

An updated works program to be always availed on site.

6.1.1.2 Drawings

Any Drawings issued with these documents are for tendering purposes only. Drawings for this projectshall be made by the Contractor or his civil consultant, and be to the approval of the Project Manager/Engineer in liaison with project consultant.
Drawings to be provided:

- Soft and Hard copies. Hard copies to always be availed on site.
- Relevant Licensed Software used during design and as built drawings
- Progressive and routine update/amendment/modification for final working drawings

6.1.1.3 Use of Site

The Contractor will restrict his activities to within the Sites. Access for others to work on the site concurrently with this Contract shall be maintained as far as possible. The Contractor shall provide warning signs on either side of the Work and flagmen if necessary to guide such

persons safely acrossthe Site. The cost of maintaining access for others and assisting the passage of others across the Site shall be deemed to be covered by and included in the rates entered by the Contractor in the Price Schedules.

6.1.1.4 Plan of Operations and Temporary Works

The Contractor shall, in accordance with Conditions of Contract and before commencing work on Site,submit to the Project Manager a fully detailed programme showing the order of procedure and methodby which he proposes to carry out the construction and completion of the Civil Engineering works, and particulars of the organization and staff proposed to direct and administer the performance of theWorks.

The information to be supplied to the Project Manager shall include Drawings showing the general arrangements of his temporary offices, camps, storage sheds, buildings and access roads, and details of Constructional Plant and Temporary Works proposed.

Site signboard design shall be approved by the Project Manager.

The contractor shall provide technical staff to be on site on permanent basis

The contractor shall provide a suitable temporary office, with a room capable of holding meetings, a Project Managers office (furnished with desk, cabinet, phone, printer), and clean toilet facilities. A siteinstruction book, weather chart and safety occurrence/ toolbox minutes book shall be provided on sitefor access to PM within all working hours.

The contractor to submit Plan for Sequence of construction, to follow the guideline as follows:

- Preliminary Design (Topographical Survey, Geotechnical Investigations, Approval of Statutory Documents, Civil Works Methodology, Standard Operating Procedures, Quality Management Plan, Safety, Health and Environment Plan, Organogram)
- Design Stage (Relevant Standards and Specifications, Drawings and Designs, Revision of Drawings, Statutory Approvals/Requirement)
- Works Program, Reporting System, Security plan.
- Closure (As-built drawings, Water Supply and Electricity Supply account transfer to .)

6.1.1.5 Contractor's Office and Accommodation, etc.

The Contractor shall be responsible for his offices, accommodation, storage and workshops. The Contractor may fence this area for his own security for the duration of the Contract but any such fenceerected together with all buildings, plant and materials shall be removed, all holes filled in and the siteleft in a tidy and level condition upon completion of the Contract.

6.1.1.6 Dealing with Water

The Contractor shall keep the whole of the Works free from water and he will be deemed to have included in his rates in the Price Schedules for all pumping, shoring, temporary drains, and sumps andother measures and provisions necessary for such purposes and for clearing away and making good tothe satisfaction of the Project Manager damage caused thereby.

The Contractor shall keep all existing drainage channels clear and shall not obstruct the passage of water to or away from any such drainage channels.

Works to be self-draining after construction. Pumps not allowed in substations. No drains should empty to neighbouring plots unless with project manager approval.

6.1.1.7 Liaison with Police and Other Officials

Contractor shall cooperate closely with the Police and other officials of the area concerned regarding their requirements in the control of workmen, movement of traffic, or other matter.

6.1.1.8 Explosives and Blasting

The Contractor shall use explosives for blasting in connection with the work only at such times and places and in such a manner as the Project Manager may approve, but such approval shall not relieve the Contractor from his responsibility for injury, loss, inconvenience and annoyance to persons, the Work and adjoining structures, roads, places and things and injury or damage to animals and property consequent on the use of such explosives. The Contractor shall be entirely liable for any accident that shall occur and shall save the Project Manager harmless and indemnified from all claims arising from such use of explosives.

The Contractor shall keep in his office at the Site copies of Laws applying to the transport, storage and use of explosives and shall also submit to the Project Manager a copy of any instructions or notices which the Contractor may issue to his staff or workmen or post about the site in compliance with such Laws.

The Contractor shall submit to the Project Manager details of the explosives, which he proposes to use, and of his proposals for the transport and storage of explosives.

6.1.1.9 Works Executed by the Project Manager or by Other Contractors

The Project Manager reserves the right to execute on the site, works not included under this Contract and to employ for this purpose either his own employees or other contractors.

The Contractor shall ensure that neither his own operations nor trespass by his own employees shall interfere with the operations of the Project Manager or his Contractors employed on such works and the same obligations shall be imposed on the Project Manager or his contractors in respect of work being executed under the Contract.

The Contractor shall provide unhindered access to all parts of the site to the Project Manager, authorised representatives of the Project Manager and of public bodies and corporations, and to contractors employed by the Project Manager, and he shall make available to such authorised persons the use of all temporary access tracks in or about the site.

Where works are being carried out concurrently in one area careful co-ordination of operations will be required so that interference can be minimised. The Project Manager shall have the power to regulate and rearrange the order of execution of the Works under this Contract to achieve the best co-ordination practicable. The Contractor's programme shall take into consideration all information on co-ordination available at the time of its preparation and it shall be flexible enough to allow for subsequent changes that may become necessary. The rates tendered for the Works shall include the costs of complying with the requirements of this Clause.

6.1.1.10 Water Supplies for the Works

The Contractor shall make his own arrangements for the supply of palatable water for his staff on site, the Project Management Team and water for the Works.

The Contractor must make all arrangements including the supply of pumps and motors, labour and the like to abstract water and must pay royalty to the owners. These costs shall be included in his prices.

If the Contractor fails to obtain permission to utilise existing water sources, he may have to

drill boreholes near the sites at suitable locations.

The Contractor shall obtain the Employer's or the Project Manager's prior approval before utilizing any water source for the Works. The contractor shall connect the site to main water supply on completion of works. In addition, provide ground mounted 10,000 litres water storage and two other high level 1000 litres tanks for the toilets with necessary pumps. The contractor shall provide for waterharvesting system.

6.1.2.10.1 Employer's Approval of Finished Works

The Contractor shall obtain the approval of the Project Manager for each section and each stage of construction. Approval of any section of any stage will not be given, and the Contractor shall not proceed with any subsequent stage, until all tests required by the Project Manager have been carried out, and the results have shown that the section complies with the Specification. Any works rejected by the Project Manager as not complying with the Specification shall be replaced by the Contractor athis own expense.

6.1.2.10.2 Preservation of Trees

No tree shall be removed without prior permission of the Project Manager who will limit the removalof trees to the minimum necessary to accommodate the permanent Works.

6.1.2.10.3 Survey Beacons

During the progress of the Works, the Contractor shall not remove, damage, alter or destroy in any way any permanent beacons or survey beacons. Should the Contractor consider that any survey beaconwill be interfered with by the Works, he will notify the Project Manager, who, if he considers necessary, will make arrangements for the removal and replacement of the beacon.

If the Contractor removes or disturbs a beacon without the prior permission of the Project Manager heshall be liable for the full cost of its replacement together with the full cost of re-establishing the datarelevant to it. The contractor shall establish the beacons once handed over the site.

6.1.2.10.4 Basic Survey and Setting Out

The Contractor will survey the sites provided in detail, and the exact locations shall be agreed with theProject Manager.

The details of beacons and benchmarks shall be provided in the site survey drawings.

The Works are located on the drawings and the Contractor shall appoint a suitably qualified Surveyorto set out the Works from the beacons and shall plot cross sections at 10 m intervals and submit to theProject Manager for approval.

No separate payment will be made for any work in connection with the setting out of the Works, nor any other Works required by the Contractor to ensure the accurate location and construction of the Works.

The survey should capture data from neighboring plots, data for terminal drainage points, nearest mainroad and capture all existing services (overhead, terrestrial and underground).

The Finished Floor Level of the Control Building shall be a minimum of 600mm above the external Finished Ground Level. The top of equipment foundations shall be 200mm minimum above Finished

Ground Level. The top of cable trench walls to be 150mm minimum above Finished Ground Level. The Finished Ground Level to be such that no flooding can occur and shall be to project manager's approval.

6.1.1.11 EARTHWORKS

6.1.2.11.1 Bush Clearing

The areas of the platform and borrow pit shall be cleared of all trees, vegetation and roots. These shallbe neatly stockpiled within 3 km of the site at locations agreed with the Project Manager and shall remain the property of the land owner.
Any structures on site to be demolished and removed by the contractor and to be included in the priceschedule.

6.1.2.11.2 Access and Internal Roads

Where necessary access roads to the substation sites shall be constructed to the standard of the approving authority or otherwise gravelling / murram standards. Approvals for roads shall be sought from the relevant authority before commencement of works.

Internal substation road and walk paths shall be compacted to 100% MDD after grading and shall havefinal paving layer of minimum standard paving blocks to meet load weight of not less than 80mm thick, 49N/mm2 or equivalent superior. The road shall also be lined with kerb line and channels (withconvenience markings in reflective road paint) and shall be constructed to a fall that will allow properdrainage of the road. The road shall have adequate drainage provided. Deceleration and acceleration lanes will be constructed to paving standards where necessary or as per the requirements of the highways Authority. The horizontal alignment and geometric design shall be to relevant road design manuals. The road shall have minimum width of five (5) meters with the alignments allowing for lowloader trailers.
Provision shall be made for parking and offloading lot.

A-Gravel Access (Gravel Wearing Course – GWC)

A.1 General

All access roads to the substation will be gravel/Murram standard and their alignments will be designed to accommodate construction and future maintenance traffic.

Any damage occasioned by whatsoever cause during construction shall be repaired by spot gravelling,reshaping and re-compaction at the end of contract such that the road to be handed over will be defectsfree.

A.2 Materials Requirements

Gravel standard roads comprise of a single layer of selected granular material placed directly on the sub grade to serve as a pavement and as surface-wearing course. The gravel for the single layer shouldbe of adequate quality to guarantee the following:

a) General

In general gravel wearing course materials should comply with the following:

- They should have sufficient cohesion to bind the particles together and prevent the surfacefrom raveling and becoming corrugated in the dry season.
- The amount of fines and plasticity should be limited so as to avoid the occurrence of dusty andslippery conditions in dry during the dry and wet weather respectively.

b) Grading Requirements:

Grading curve of the gravel should be within the class 1 envelope (initial daily number of commercialvehicles less than 150) to guarantee good stability. The grading to consider is that obtained after processing and compaction.

Grading after compaction		
Size (mm)	% passing by weight	
	Class 1	Class 2
37.5	-	100
28	100	95 – 100
20	95 – 100	85 – 100
14	80 – 100	65 – 100
10	65 – 100	55 – 100
5	45 – 85	35 – 92
2	30 – 68	23 – 77
1	25 – 56	18 – 62
0.425	18 – 44	14 - 50
0.075	12 - 32	10 - 50

c) Plasticity Requirements

Plasticity index of the gravel should not exceed 15 and shall not be less than 5 in wet areas (annual rainfall greater than 500 mm per year). In dry areas (annual rainfall less than 500 mm per year) maximum plasticity index shall be 30 but subject to a minimum of 10.

d) Bearing Strength Requirements

A minimum CBR (after 4 days soak) of 20% at 95% MDD and OMC (Modified AASTO T180) is required

e) Construction Procedures

Gravel materials are excessively coarse in their "as dug" state. Appropriate processing is therefore necessary to bring them to the required gradation. This is normally done on the road by using grid, cleat or sheep's foot rollers. Oversized particles which cannot be broken down to the required size shall be removed.

The minimum thickness of a compacted layer shall not be less than 125 mm.

A.3 Pavement.

The single gravel layer should consist of a minimum thickness necessary to avoid excessive compressive strain in the sub grade and to compensate for the expected gravel loss under traffic duringthe period between re-gravelling.

Where the top 300 mm layer of the formation level embankment or natural ground sub grade has a CBR greater than 5%, the following thicknesses shall be provided:

- Roads within the Switch Yard not subjected to heavy commercial vehicles– The minimum compacted thickness of 125mm.
- Access roads outside the Switch Yard and roads within the Switch Yard likely to be subjected to heavy commercial vehicles during construction and during periodic maintenance. – Providea 250 mm thick compacted layer.

In addition to the above, where the in-situ sub grade or the embankment material has CBR strengthof less than 5% then:

- Top 300 mm layer of the fill / embankment shall be made with selected imported material withCBR (after 4 days soak) of between 7 and 13%.
- Where in situ sub grade an improved sub grade 300 mm thick of imported materials with CBR(4 days Soak) of between 7 and 13% shall be laid.

The above thickness shall extend to cover the shoulders to a minimum of 1m. A cross fall of 4% shallbe provided.

Compaction will be in layers not thicker than 200 mm and will achieve compacted densities of 95% MDD (Modified AASHTO T180) at compaction moisture contents of between 80% and 105% OMC.

a) Existing Bitumen Standard Access and Internal Roads

All shall be reinstated to their original standard of materials and construction.

b) Quality Control

Tests shall be performed by the contractor on soils and gravels undergoing compaction under the supervision of and at frequencies determined by the Project Manager and shall include:

- Determination of the Atterberg Limits in accordance with BS 1377.
- Determination of particle size distribution in accordance with BS 1377.
- Determination of dry density / moisture content relationship in accordance with BSstandard compaction and modified AASHTO T180 as appropriate.
- California Bearing ratio (CBR) in accordance with AASHTO T193.
- Field dry density as set out in BS 1377.

6.1.2.11.3 Removal of Top Soil

The top soil within the areas of platform and shall be stripped to an approximate depth of 200 mm andstockpiled at locations agreed with the Project Manager for later use on embankment slopes. Any topsoil that shall not be reused shall be dumped at the designated local authority dump sites

Overburden in the borrow pit shall also be stripped to a depth specified by the Project Manager and stockpiled for later use in rehabilitation.

6.1.2.11.4 Classification of Materials

Earthworks shall be under the contractors' scope and considered fully priced by the contractor.The contractor shall familiarise with site conditions before tendering.

6.1.2.11.5 Order of Work

The construction of cuttings, side drains and embankments shall proceed in a methodical and orderlymanner. It shall be solely the Contractor's responsibility to arrange his methods and programme of work so as to ensure that the earthworks are carried out by the most efficient and economical methodpossible with the type of plant employed on the Works.

All trimming of cuttings, and embankments, drains and shoulders to the specified slopes and shapes, shall be carried out concurrently with the earthworks that are being carried out at that particular site and level.

6.1.2.11.6 Fill Material

"Fill-material" shall mean material deposited in accordance with these specifications from any of the classes specified in order to build up an earthworks construction to formation level as shown on the Drawings or as ordered by the Project Manager. The Contractor shall obtain the fill material from a source approved by the Project Manager.

Fill materials will generally be obtained from cuttings. If the material obtained from this source is insufficient or unsuitable extra material shall be obtained from borrow areas. All fill material (other than rock fill in lower layers) shall pass 75mm BS sieve size.

The following materials are generally unsuitable for construction of fills.

- All materials containing more than 5% by weight of organic matter (such as top soil,materials from swamps, plants and vegetable matter)
- All expansive soils such as black cotton soils with swells of more than 3% as measuredin the CBR test.
- All clay soils with plasticity index exceeding 50.
- All materials having a moisture content of 105% of the optimum moisture content(standard compaction)

Rock fill can be used provided that boulders greater than 0.2 M^3 in volume or 600 mm in size are notused and that this material is not placed within the top 600 mm to formation level. The best materialsfrom cuttings or borrow areas should be reserved for the upper layers of the fill.

a) Compaction of fill

Materials other than rock fill shall be placed in layers of compacted thickness not exceeding 300 mm.thicker layers can only be permitted where very heavy compacting equipment is available and trial sections have proved that the required compaction will be readily achieved over the layer depth. The minimum layer thickness shall be twice the maximum particle size of the compacted material.

Fill material shall be compacted throughout to a dry density of at least 95% MDD at OMC (standard Compaction AASHTOT99) except the top 300 mm of the fill which shall be compacted to 100% MDD(AASHTO T99).

Where rock fill is used it should be placed in the bottom of the embankment. The largest sizes shall be placed in layers of 1.0 meter thick. The interstices shall then be filled with smaller rocks and approved filler material. The whole layer shall then be compacted until the interstices are completelyfilled or until the required settlement is obtained. Heavy vibratory rollers are generally the most suitable machines for compacting rock fill.

The specified compaction shall be achieved over the full width of the embankment.
Any area inaccessible to the roller shall be consolidated and compacted using approved mechanical tampers.

b) Compaction of In-situ Subgrades

After removing the top soil and/or 600 mm minimum thickness (or as determined by geotechnical report) of unsuitable /expansive soils and before placing fill, improved sub grade or gravel wearing course, the upper 300 mm of in situ sub grade will be compacted to 100% MDD standard compaction.Compaction in cuts without improved sub grade will likewise be compacted to 100% MDD standard compaction

6.1.2.11.7 Spoil Material

"Spoil-material" shall mean material excavated in accordance with these specifications from any of the classes specified, and which, being obtained from the excavation of side drains, cuttings or belowthe road, embankment is unsuitable for the requirements of the Works. Spoil material shall be removedfrom the Site to a spoil tip which should be to a site acceptable by respective local authorities and shallbe approved by the Project Manager.

6.1.2.11.8 Expansive Material

When expansive material is encountered, it shall be removed to a minimum depth 600 mm (or as determined by geotechnical report) below the formation or the existing ground level, whichever is greater. Material removed shall be stockpiled for later use in slope protection or spoiled to a tip as instructed by the Project Manager.

6.1.2.11.9 Surplus Material

"Surplus-material" shall mean material excavated in accordance with these specifications from any ofthe classes specified and which is temporarily surplus to the fill requirements and shall be carted to adesignated stockpile for re-use later elsewhere in the Works, or to an approved spoil tip.

6.1.2.11.10 Side Drains

Where side drains are required excavating the lines, slopes and widths as designed by the Contractor and approved by the Project Manager shall shape them. The side drains shall be finished off so that the formation levels and camber or super elevation of the formation, level and cross fall of the shoulders, and shape and invert levels of the side drains are everywhere in accordance with the Drawings.

Any excess depth or width excavated from the side drains shall be backfilled and made good to the satisfaction of the Project Manager at the Contractor's expense.

All other types of drains are specified separately in this Specification.

6.1.2.11.11 Excavation in "Rock"

a) Excavation Level

Unless otherwise directed, the formation of the platform can be founded on rock. However, rock shallbe excavated to an average level 150 mm below the formation and in no place less than 100 mm belowthe formation.

b) Backfilling for Surfaces

Any excess excavation in rock below the formation shall be backfilled and compacted using approvedfill material. Excess excavation in the invert of drains shall not be backfilled, but the rock surfaces shall be trimmed, and all loose particles removed, to allow laying of drainage blocks or as may be required.

c) Excess Excavation of Slopes

Where side slopes are over-excavated no backfilling will be required but the slopes shall be trimmed to a neat shape and safe angle as is acceptable to the Project Manager. The sloping

sides of all cuttingsshall be cleared of all rock fragments, which move when prised with a crowbar.

d) Hard Material

The provisions of this Clause do not apply to hard and common materials, which materials shall be excavated to the lines and levels shown on the Drawings or as instructed, within the permitted tolerances.

6.1.2.11.12 Setting Out and Preparation for Earthworks

The Contractor shall set out the earthworks and the tops of cuttings and toes of embankments at intervals 10m. Reference pegs shall be provided clear of the earthworks and at right angles to the centre lines, from which the centre lines and levels can be re-established at any time.

Before the construction of any earthworks in the fills, the levels of the existing ground shall be agreedbetween the Contractor and the Project Manager. If the Contractor fails to take the requisite levels, thenthe ground levels determined by the Project Manager shall be taken as correct.

6.1.2.11.13 Construction of Earthworks to Formation

All earthworks up to formation shall be formed and completed to the correct lines, slopes, widths andlevels shown on the Drawings and with the sub grade parallel to and at the correct depth below the profile, camber, cross fall or super elevation shown for the finished level, unless otherwise directed bythe Project Manager.

Embankments and fills shall be constructed only of suitable material obtained from the excavation ofcuttings. If the Contractor encounters material which he considers unsuitable for earthworks, then heshall forthwith inform the Project Manager, who shall instruct the method of use or disposal of such material. If insufficient material can be obtained from the cuttings, additional material may be borrowed from approved borrow pits.

The Project Manager may direct that, certain soils be excluded from certain layers and other soils setapart or obtained from borrow and used only for these layers, in which case the Contractor shall comply with the Employer's or the Project Manager's directions and shall allow in his price for such selection of materials.

6.1.2.11.14 Unsuitable Material Information

Where, in the opinion of the Project Manager, unsuitable material occurs in cuttings, the Contractor shall excavate it to the depths and widths directed and replace it with selected fill material to form animproved formation.

6.1.2.11.15 Spreading and Compaction of Embankment and Fills

Embankments and fills shall be laid out and compacted to achieve a stable platform with sufficient bearing capacity and stability.

6.1.2.11.16 Drainage of Works

All cuttings, embankments and borrow pits shall be kept free of standing water and drained during thewhole of the construction.

Should water accumulate on any part of the earthworks, either during construction or after construction, until the end of the maintenance period, giving rise to soaking or eroding

conditions in the earthworks, the Project Manager may order the Contractor to remove and replace at the Contractor's expense any material which has been so affected.

All drains shall be maintained throughout the Contract in proper working order.

The Contractor must allow in his price for draining the earthworks satisfactorily at all stages during the construction and arrange his methods and order of working accordingly.
The entire platform shall be adequately drained and all cable trenches including those in switchgear building should be well drained. The minimum slope of drain channels shall be 1:200. Complete drainage of the entire site shall be done including subsurface drains and/or drainage to local authoritydrains.

6.1.2.11.17 Sub-grade Layer

During this process the sub grade layer shall be graded to level, parallel to the cross fall or chamber and profile shown on the approved design drawings or directed by the Project Manager and to agreedtolerance.

6.1.2.11.18 Tolerances

The following tolerances will be permitted in the finish of the formation to roads and platform:

a) The level of the formation should be within +/- 100 mm of that specified.

b) On the final trimmed slope of earthworks, a variation of + or - one fifth of the specifiedslope will be allowed.

c) The tolerances permitted in the overall width of the bottom of cuttings shall be plus orminus 150 mm in the distance between center lines and the toe of cuttings slopes, and plus 150 mm in the case of embankments.

6.1.2.11.19 Protection of Embankment Slopes

The top soil and expansive material removed from the Works shall be placed on embankment slopes as directed by the Project Manager. The slopes shall be trimmed to form a gradient not less than 1 on5 unless otherwise directed.

6.1.2.11.20 Grassing of Slopes /Slope Protection/Stone Pitching

The surface of embankment slopes, after placing of top soil, shall be planted with grass or best suitedmethod as per Project Manager's approval. Unless instructed otherwise by the Project Manager, the type of grass shall be indigenous. While planting, the area shall be irrigated for as long as necessary to ensure that the grass is properly established and has completely covered the ground. Grass should only be planted in the rainy season.

6.1.2.11.21 Borrow Pits

Where it is necessary to borrow material for construction, suitable pits shall be provided by the Contractor to the approval of the Project Manager.

All borrow pits must be carefully cross sectioned before and after excavation in order to determine thequality of earth excavated.

After removal of material for use, the area must be rehabilitated by the Contractor so that it will not prove a hazard to man or beast or a source of erosion. The sides of the excavation must first be sloped and then any previously stockpiled top soil spread as far as possible.

At some borrow pit locations, further cleaning and fencing etc., may be required.

6.1.2.11.22 Soil Sterilization

In order to stop the growth of vegetation and incidence of ants, the Contractor shall apply an approvedherbicide before any spreading of stone over the platform area.

A damp-proof membrane shall be applied to the entire switch yard before ballasting. Insecticide to be used around Switchgear building and any other required area

6.1.2.11.23 Earth Electrode

The Contractor shall install Earthing electrodes in trenches as outlined in the Specifications for earthing in Particular specifications.

6.1.2.11.24 Platform Areas

The substation platform areas shall be at least 1.5 times the area required by the equipment to be installed.

6.2 MATERIALS FOR THE WORKS

6.2.1 General

All materials shall comply with appropriate local or regional standards unless otherwise required hereinafter. Such standards shall be to the approval of the Project Manager.

The Contractor shall, before placing any order for materials or manufactured articles for incorporationin the Civil Works, submit for the approval of the Project Manager the names of the firms from whomhe proposes to obtain such materials, etc., together with a list of the materials and manufactured articlesgiving the origin, quality, weight, strength, description, etc., which he proposes that the firms should supply. No materials or manufactured articles shall be ordered or obtained from any firm of which the Project Manager shall not have previously approved.

All materials (for all works including finishes and fabricated works) shall be delivered to the site within sufficient period of time before they are required for use in the Works to enable the Project Manager to take such samples as he may wish for testing and approval. Any materials condemned as unsuitable for Works shall be removed from the Site at the Contractor's expense. Contractors price toinclude these testing of materials.

The Contractor may propose alternative materials to those specified, provided that they are of equivalent quality and, subject to the Employer's or the Project Manager's approval such materials may be used in the Works.

6.2.2 Standards

Concrete pipes, porous concrete pipes, cast iron manhole covers and gratings, bricks, concrete kerbs,bituminous surfacing, cement, steel and aggregates shall comply with local or regional standard to beapproved by the project manager

6.2.3 Filter Backfill for Sub-soil Drains

This shall be graded crushed stone as for platform surfacing (below).

6.2.4 Stone for Pitching

Stone for pitching to drains, inlets and outlets of culverts, to embankments and around

structures shallconsist of sound un-decomposed rock. Precast concrete tiles may also be used.

6.2.5 Stone for Platform Surfacing

The stone shall be hard and durable crushed rock with a maximum particle size of 40-60 mm and notmore than 15% shall pass a 9.5 mm sieve.

The stone layer to be spread uniformly over the finished surface of the platform shall have a thicknessof 100 mm.

The gravel to be used on Transformer grating to be of 60-100mm size and of inert material.

6.3 DRAINAGE AND STORM WATER

6.3.1 Drainage

The Contractor shall provide sub-soil and storm water drainage, including drainage of cable ducts. The drainage system shall be to the approval of the Project Manager.

Drainage shall be in accordance with relevant Codes for Practice published by authoritative Standardsorganization such as the British Institution, e.g. BS 8301, BS 6031 and CP 2005.

A surface water drainage system covering the entire substation site shall be installed to allow total drainageof the substations. The number of runs and outfalls and pipe sizing must be sufficient to cope with theseverest precipitation (based on hydrological factors and meteorological data), with a factor of safety of 1:2 within the substation site and other areas in which maintenance will be carried out. The drainage mustallow uninterrupted access.

Embankments and cuttings are to have drainage facilities at their top or bottom. The formation level of thesite is to be formed with uniform cross-falls of about 1 in 300 in the same direction as the natural drainagepath of the surrounding environment. Drainage minimum slope shall be 1 in 200. Cable trench drains to beof minimum 1:250 slope. All storm water to be drained outside of the station. However, where not suitable, soak pits may be provided to Project engineer approval.

Surface water from roofs of buildings except the switchgear building shall be drained to down pipes, whichconnect with the general site drainage system. Surface water from the switchgear building roof shall bedrained to the main reservoir tank.

In areas where there is a risk of water runoff the substation shall be protected from failure by means ofgabions, retaining walls, and stone pitching or otherwise to the employer's approval.

The contractor shall install precast 600 mm concrete culverts for storm drain with the 200mm thick concretehaunching for the purpose of providing free flow of storm water drain at the substation entrances and orexits. Also 200mm thick reinforced concrete plastered head walls shall be installed.

6.3.2 Foul drainage

The foul drainage will be connected to a sewage drainage system where applicable or to standard septic tank for 21-30 persons to be constructed by the contractor. In the guardhouse, septic tank shallbe provided for 10-20 persons. All the necessary authority shall be sought by the contractor prior to connection, and all regulations of the council shall be

adhered to.

Pit latrines or site treatment facilities to Project manager's approval shall be provided in areas where there is no public drainage available.

Maximum distance between inspection manholes to be 20m. Designs for the same to follow local Public Health Guidelines.

6.3.4 Transformer Oil Drainage

Galvanized steel pipes to be used from oil collection pits to the Burnt Oil tank. The Burnt Oil tank design must incorporate a GI/ Steel breather pipe for necessary chambers with welded and galvanisedfabric mesh at the mouth. The design must also allow for exit of water naturally, without incorporatinga pump. Design must also ensure that no oil is released from the tank, subject to Local Authority requirements.

The oil interceptor shall have a capacity of 120% of the transformer oil capacity.

6.4 FENCING

6.4.1 Fencing

The Contractor shall construct fencing along the perimeter of sub-station's approximately one acre plot, including gates and shall comply with the requirements of the following Clauses.

All the substation fences shall be of dressed Natural stone of relevant minimum compressive strengthas per British standards. The substations shall have electric fence and razor wire on top of the perimeterwall. The perimeter wall shall have a ground beam and columns at minimum three-meter interval.

The perimeter wall shall be built of weatherproof materials and protected from the elements as necessary. The wall shall have a ground beam at the Finished Ground Level. The substation boundarywall shall be of minimum height 2.7m above the highest Finished Ground level.

The electric fence to be installed shall have 8nos. Strands separated at 100mm spacing. Anchors to bebuilt at minimum 350mm anchorage length inside RC columns. The anchors shall also be galvanisedin coastal areas. The top of the wall shall have coping to protect the stonework.

The razor wire shall be of minimum 450mm diameter and placed together with the electric fence. Theperimeter wall shall be provided with lighting at 6m spacing.

Expansion joints to be provided at every 30m and to follow engineering standards. Retaining walls shall be provided in all masonry walls where level differences on both sides of the wall exceed 1.2m.

Chain link fence to be used ONLY where specified.

6.4.2 Dimensions

Height of the stone fence: 2 700 mm from the highest Finished Ground LevelHeight of chain link fabric: 2 000 mm

6.4.3 Chain link Fence (Demarcation of 'S and KAA'S HV Switchyard)

Barbed wire: 3 wires above fabric, height of 300 mm, on supporting arms facing outwards from Siteat 450 angles.

Maximum distance between posts or columns: 3000 mm, except where interrupted by a gate.

Terminal posts: including end, corner and straining posts; 89 mm outside diameter 114 mm outsidediameter at gates.
Embedment lengths of terminal posts:

- Corner and straining posts 1100 mm
- End posts 1200 mm
- Gate posts 1400 mm

Tension bars and bands: locate at terminal posts to fix fabric, bottom wire and barbed wire.Top rail: "extra-strong" pipe, 43 mm outside diameter.
Braces: "extra-strong" pipe, 43 mm outside diameter for attaching end and gate posts to adjoiningposts. Use two braces at corner and restraining posts.

Gate width: free distance between 2 gate posts, 1500 mm for single gate, 5000 mm double gates.Separate pedestrian gate to be provided.

Double gates: one leaf for normal traffic, other leaf to remain closed by means of drop bolt lockinginto center rest, inoperable from exterior.

Gates: able to open in either direction to 1800. Gates to be hinged on a kingpost and not directlyhinged on the concrete column.

Gate hardware: three hinges, latch with padlock accessible from either side of gate, latch catch. Gatesto be of solid panel, gauge 16 and designed to Project Manager's approval.

Top of posts and uprights: weatherproof tops.

6.4.4 Materials

Fabric: ASTM A 392, 2 000 mm high, 3.8 mm diameter (No. 9 gauge) steel wire, 50 mm diamondpattern, twisted and barbed finish at top, knuckled wires at bottom, zinc coated.

Pipes: ASTM A 120, steel pile, hot-dipped zinc coated after welding, diameter and weight size asshown on drawings, unthreaded ends, free from burrs.

Fence fittings: ASTM F626, hot-dipped zinc coated according to ASTM A123.

Barbed wire: ASTM A121, 2.51 mm diameter wire in strand (No.12-1/2 gauge), 2 strands with 4-pointbarbs spaced at 125 mm, Class 3 zinc coating.

Bottom wires: 5 mm (No. 6 gauge) steel wire, 500 g/m2 zinc coating. This shall be surrounded by aconcrete beam (C20) as shown on the drawings.

Fence fittings: ASTM F 626, steel tension bars and bands, nuts and bolts, weather proof tops of commercial aluminium alloy, malleable cast iron, or rolled or pressed steel, cast iron and steel fittingshot-dipped galvanised with 500 g/m2 according to ASTM A123.

Concrete: 25MPa at 28 days

6.4.5 Installation

Install fencing and gates according to ASTM F 567 unless otherwise indicated, and to drawings and this Specification.

Level ground surface so that space between finished ground surface elevation and bottom of fabric does not exceed 50 mm.

Plumb and align posts to within 10 mm.

Install posts of a gate at same elevation regardless of difference in ground level.

Set posts in concrete footings in form of truncated cone, according to ASTM F 567, and as follows:

FOUNDATIONS	ORDINARY SOIL		SOLID ROCK	
(Dimensions)	Line Posts	Terminal Posts	Line Posts	Terminal Posts
Depth	1000 mm	1600 mm	300 mm	500 mm
Diameter at top	250 mm	300 mm	150 mm	150 mm
Diameter at bottom	350 mm	400 mm	150 mm	150 mm

Make joints in fabric at terminal posts.Fasten as follows:

a) Every 450 mm along top rail, braces and bottom wire;
b) Every 300 mm on line posts.

Secure barbed wire to terminal and gate posts with tension bands, and to gate uprights with hooks.Install bottom wire in middle of last line of mesh.

6.5 CONCRETE AND BUILDING WORKS

6.5.1 Earthworks

Soil Investigations

The contractor shall collect all data he deems necessary for preparation of his bid.
The Contractor shall be required to perform sub-soil tests within the area of the switchyard to the depthand by the method of test specified by the Project Manager. The details of performing the test, tools and equipment to be used for, shall be submitted to the Project Manager for approval.

The sub-soil tests shall be carried out by any method as stated hereafter under the

supervision of a qualified person, who shall be subject to approval of the Project Manager. The price should include any rock encountered during construction.
Any boulder rocks encountered shall be removed
completely. Excavation
Excavation for concrete foundations shall be carried out in strict accordance with the requirements ofthe Project Manager and to fit in with the programme of construction.

Shoring and Timbering of Excavation
The Contractor shall be entirely responsible for the safety of all excavations, for the prevention ofinjury to workmen and for the stability of the faces of the excavation.

The adjacent road surfaces must remain trafficable, and cracking or cave-ins must be avoided. All shoring and timbering shall be done to the approval of the Project Manager, who may order such shoring or timbering to be strengthened or altered if he considers this necessary in the interests of thework or to safeguard against accidents to workmen or cave-ins. For the purpose of measurement the following categories of shoring shall apply:

Dewatering
The whole Works shall be constructed in dry and the Contractor shall be held responsible for keepingall excavations free from water, whatever the source or cause may be, and shall properly deal with anddispose of water by use of sufficient temporary works, plant and appliances so as to ensure that the whole Works is executed in a satisfactory dry and safe manner, and costs for all dewatering operationsshall be included in the price for civil works.

Excavation to be approved
In no case shall broken stone for under drainage or concrete be placed in an excavation until the surfaceon which such materials are to be placed has been approved by the Project Manager.

The Contractor shall advise the Project Manager whenever the bottom of any excavation is ready for inspection or whenever it is necessary to cover up the work. In default of such notice the foundation shall on the order of the Project Manager be uncovered by the Contractor and reinstated without extracharge.

Disposal of Excavated Material
All material excavated under this Contract shall be disposed of in accordance with the instructions issued by the Project Manager. Selected material required for back-filling shall be removed to a tip found by the Contractor and the Contractor shall be responsible for ensuring that the required amountof spoil is set aside.

Other Services
Where trenches pass near or across other services, the Contractor shall take every precaution against damaging such services. These services shall be properly supported in the trench until back-filling iscomplete and the back-filling shall be thoroughly compacted under and around such services.

Backfilling
Back-filling shall be carried out either with selected spoil as set aside, or with imported selected spoil,or other material to the approval of the Project Manager.

No back-filling shall be done until all the formwork has been removed together with pieces of timber,cement bags, vegetation and or other rubbish.

All back-filling shall be compacted in layers not exceeding 150 mm thick and shall be sprayed withwater to bring the moisture content to the optimum for dense compaction.

Compaction shall be to the approved standard.

6.6 CONCRETE, FORMWORK AND REINFORCEMENT

6.6.1 Material

Aggregates

a) Shall conform to BS 882.

b) Shall be heaped separately on hard, self-draining surfaces.

c) Normal size of coarse aggregate shall be 20 mm.

Water
Shall be fit to drink

Reinforcement
Shall conform to BS 4449.

Reinforced Concrete
Shall be designed to BS 8110, Foundation BS 8004

Steel
Shall be designed to BS 5950

Cement Shall

a) Conform to BS 12.
b) Be either normal Portland or P.C. 15. Pozzolana cement shall be used.

If acceptable to Project Manager, Cement shall be 42.5R for works with progressive development.42.5N to be used in Transformer and equipment foundations.

c) Be used within 6 weeks of manufacture.
d) Be stored in a manner to exclude any moisture.
e) Be stored in a manner to ensure use of the earliest consignment.
f) Different types of cement from different manufacturers shall not be mixed for a single cast orstructural element.
g) Cement to be used in coastal areas shall be sulphate resistant.

Additives shall not be used in this project.

Before concreting

Design Mixes
Not less than 2 weeks before the start of concrete work, the Contractor shall submit to the Project Manager for his approval a statement of proposed mix proportions for the various grades required in the project. (Note: the grade is the characteristic strength or the cube strength below which not morethan 5% of the result may be expected to fall when tested at

28 days).

The statement shall include proportions of cement, fine and coarse aggregate, and water, the maximumand minimum slump and the target strength for each grade.

A certificate by recognized laboratory that the proposed mix will meet the requirements must accompany the statement.

The proportions stated may not later be altered without the written approval of the Project Manager. Cost of mix designs to be borne by the Contractor.

Formwork

Formwork shall be sufficient to leave the concrete finishes specified on drawings and to be within thetolerances specified in the following table and to provide an acceptable surface for applied finished, where required.

Line and Level	1mm per metre not exceeding 5mm
Pockets, Sleeves etc.	+/- 5 mm
Bases	+/- 50 mm

The concrete shall have a smooth finish free of projections, voids, etc. The type of ties to be used shall be such that the required finish is achieved and does not become marred by subsequent corrosion. Ties to be set out to definite pattern to the Employer's or the Project Manager's approval. Rubbing down is allowed only after the Employer's or the Project Manager's approval of the surface to be treated.

All concrete works including foundation bases must have formwork. No casting shall be done directto earth sides.

Reinforcement

Shall not be heated or re-bent without the Employer's or the Project Manager's permission. Shall be of strength specified in BS 8110 and of ribbed type only.
Shall be free from any material likely to impair bond or initiate corrosion.

Shall be bent and fixed according to the Project Manager bending schedules and as per BS 8110 detailing.

Shall be tied with soft iron wire to Project Manager's approval.

Shall be supported to maintain the following minimum cover during concreting.

a) The greater of the diameter of the bar or 40 mm for external un-plastered face.

b) The greater diameter of the bar or 15 mm for internal face.

Shall be inspected by the Project Manager.

NOTE: Holding down bolts shall be supplied under the civil works part or by the main contractor if heso decides, and in any case be included in the turnkey price.

Construction Joints

Shall be avoided if possible, but if inevitable shall be pre-planned in consultation with the Project Manager and temporary stop ends inserted. Before placing of concrete against a

construction joint, the formed face shall be hacked down to expose the coarse aggregate, kept continuously wet for 24 hours. Vertical faces should be covered with cement/water slurry and horizontal faces should be covered with 15 mm layer of cement/sand grout. New concrete should then be placed immediately.

Camber
To formwork shall not be at the expense of the overall depth of the concrete.

Weather
Concrete shall not be placed if temperatures above 30 degrees Celsius or below 0 degrees Celsius areexpected during concreting

Batching Shall

a) Be by mass in accurately calibrated scales or be volume in soundly constructed gaugeboxes making due allowance for bulking of the fine aggregate.

b) Be in proportion to whole sacks of cement.

Mixing Shall

a) Be in a machine in good condition, large enough to carry the whole mix, controlled bya competent experienced operator.

b) Be for sufficient time to ensure complete mixing of the ingredients.

PlacingShall

a) Be under the control of a competent, experienced overseer.

b) Be in a manner to prevent separation of the ingredients.

c) Be a continuous process until the pour is complete.

Compaction

a) Shall be by immersion (poker) vibrator in the hands of experienced operators.

b) Concrete shall not be moved by vibrator.

c) Shall be sufficient to remove all air pockets and honey-combing and to ensure complete dense concrete cover to all reinforcement.

Testing

a) Making of concrete cubes by Contractor under Project Manager's supervision. Contractor shall arrange for transport of cubes to approved testing laboratories. Cubes to be in sets of 3.

Curing

a) Shall commence early on the morning following the placing of the concrete.

b) Shall be effected by keeping the concrete in a permanently wet state.

c) Membranes shall not be used.

d) Shall continue for a minimum of seven (7) days or such longer time as may be required by the Project Manager.

Stripping of Form work

a) To soffits shall not be struck until 7 days after placing of concrete (but see below for(props).

b) To vertical faces shall not be struck until 14 days after placing concrete.

c) Props to soffits shall not be struck until 14 days after placing concrete.

d) Shall not be stripped without the Employer's or the Project Manager's approval whohas the power to vary the above items.

Patching

a) To defective work shall not be undertaken before the item has been shown to the Project Manager.

b) Is a sign of poor work-manship. The Project Manager shall have the right to reject thecomplete element if an unreasonable amount of patching has to be done, or if patchingwill spoil the appearance of the finished concrete.

Records

Are to be kept by the Contractor, showing date and time of each concrete pour, the weather conditions,the temperature, the number of the cubes which represent the concrete, the slump and any other items which the Contractor and/or the Project Manager consider relevant. These records are to be made available for the Project Manager inspection when required.

6.6.1 Foundations

Foundations to Transformers and for circuit breakers, switches and insulators pedestals shall be at a depth not less than 1200 mm from the existing ground level.

Transformer foundation shall allow for oil collection pit and an oil interceptor .Firewall shall be reinforced concrete where necessary. The transformer pedestal to cover the entire mounting of the transformer base. All foundations to be base and pedestal type.

The oil interceptor shall have a capacity of 120% of the transformer oil capacity.

6.6.2 Cable Ducts and Trenches

The Contractor is responsible for all civil engineering works required for the cable runs between switchgearand buildings, in reinforced concrete cable trenches. Cable entries into buildings and road crossings shallbe through 150 mm diameter heavy gauge ducts or in reinforced concrete cable trenches Two (2) lines of150 mm diameter heavy gauge of spare ducts shall be provided. Trench covers inside the building will beof 6mm thick Metal Chequer plates reinforced with 25x25x4mm angle iron welded underneath along theedges and across 'X" formation and with facilities for easy handling on removal (provide drop-down handles for easy handling and non-trip safety), except in areas where heavy traffic is expected where covers will be of concrete finished with terrazzo to match the floor finish.

Trench covers outside buildings shall be of reinforced concrete, designed for the maximum likely imposed loads appropriate to their location. The covers to have steel angle line all round. The trenches and ductsshall be silt proof to prevent silt and debris from entry. The trenches shall be raised to a level of minimum150mm above the Finished Ground Level that keeps away storm water from flowing in. The trench coverswill be constructed such as to allow easy access to the trench by means of handles or otherwise installed forevery fourth slab. Concrete cable trenches shall be adequately drained to soak pits of adequate capacity orshall be connected to the general drainage system such that they will remain ~~as~~ dry . The trench covers willbe fitted into grooved sides of the trench walls for a flush top of trench and covers. Where the cable trench is crossing roads the ducts shall be constructed in such way that they will be able to withstand the weight imposed on them.

Power cables and control cables shall be laid on suitable hot dip zinc galvanized cable racks and perforatedcable trays and in separate trenches. Cable entries into buildings shall be sealed to prevent the entry of dust, vermin water, etc., using suitable materials. All cable trenches shall be reinforced concrete.

Cable entries to be 150mm below the finished internal cable trench level.

6.7 BUILDER'S WORK

6.7.1Setting out Walling

The Contractor shall provide proper setting out rods and set out all work on the same for courses, openings, heights, etc. and shall build the walls and piers, etc. to the widths, depths and heights indicated on the drawings and as directed and approved by the Project Manager.

Materials

a) Cement
Cement shall be as described in concrete Works, Part 6B.

b) Fine Aggregates
Fine aggregates for concrete blocks shall be as described for fine aggregate in Concrete Works.

c) Coarse Aggregate
Coarse aggregate for concrete blocks shall be good, hard, clean aggregates from an approved quarry. It shall be free from all de-composted materials and shall be graded up to 7 mm, and all as described for coarse aggregate, Concrete Works.

d) Machine cut stone.
This shall be to BS 5628.
This shall be to approval of project manager and meet minimum required specifications.Minimum requirement is compressive strength of 7N/mm^2.

e) Natural Dressed
Stone This shall
be to BS 5628.

Concrete Blocks

Concrete blocks for walling shall be provided by the Contractor complying with B.S. 6073, and madein approved block manufacturing machines.

Minimum thickness of blocks in external walls shall be 150 mm, and in internal walls the thickness shall be minimum 100 mm.

Blocks in external walls shall be hollow type. The volume of the cavities shall be not more than 50 %of the gross volume, and the dimensions of the cavities arranged so that each cavity is vertically continuous when the blocks are bonded. Blocks in internal walls shall be of the solid type. Samples ofthe proposed block types shall be approved by the Project Manager before any walling work is commenced.

Blocks shall be cast under sheds in suitable block manufacturing machines either power driven or handoperated. The form shall be of steel, and accurately made to size to give the required shape and squareness of block. The concrete shall be vibrated during casting to achieve a dense and uniform concrete. The material shall contain only sufficient water to obtain full chemical reaction of the cementand to give proper workability of the constituents.

The ratio of combined aggregate to cement shall not exceed 3:1. The Contractor shall present his proposal for mix recipe supported by test results for the Project Manager's approval.

Concrete shall have minimum 28 days strength of 20N/mm2 in accordance with B.S. 1881. Mixing shall take place in mechanical mixers so as to thoroughly mix the constituents to a uniform consistencybefore casting.

On removal from the machine the blocks shall be carefully deposited on edge on boarding or a clean concrete floor under sheds so as to prevent drying out by the sun for 3 days. During this time blocks shall be kept constantly damp. The blocks may then be laid on edge in the open and kept damp by spraying or covering with wet hessian or by other means for a further 5 days. The blocks may then bestacked if required, but not more than one meter high, and in such a way as to prevent damage to the edges and corners.

No blocks may be used in building or be transported to site before having reached required 28 days strength criterion. All concrete blocks shall be of even texture and properly mixed ingredients and allportions of the block shall be properly set and hardened concrete.

Blocks shall be free from cracks or blemishes and shall be true to shape and size with clean sharp edges and corners and with corners truly square. Damaged blocks shall immediately be removed fromthe site. No dimension of a block shall deviate individually by more than 3 mm from the correct size.The average length, width and height of a sample of 15 blocks should neither be longer nor less than 2 mm than the correct size.
Dressed natural stone blocks at least 200mm width may be used as alternative to the concrete blocks.

Cement Mortar

The cement mortar is to be mixed in the proportions of1 Cement, 4 Sand, and thoroughly incorporatedwith a sufficiency of water. Any cement mortar which has been left for more than one hour shall not be used in the Works.

Building Walling

All block work shall be laid in raking stretcher bond solidly bedded, jointed and flushed up in mortar.Where wall faces are to be plastered the joints shall be raked out to form a key. The blocks shall be thoroughly wetted for at least 24 hour before laying. Walls shall be carried up evenly course by course.During laying an open joint not less than 15 mm wide shall be left between the ends of all concrete lintels, whether pre-cast or cast in-situ and the blocks adjacent to these ends. These open joints shall be left as long as possible during construction and not filled until plastering or other works render suchfilling necessary. All such joints shall be properly filled in before the completion of the work. Externalwalls shall be reinforced with two 8 mm high yield steel bars in every third horizontal mortar joint. The building shall be designed as a framed structure.

Block work which is not to be rendered or plastered shall be finished with a fair face and the blocks shall be selected for even texture and unmarked faces, regular shape and square unbroken arrases. Theblock work shall be pointed as the work proceeds with a neat joint. Where block work is to be renderedor plastered the joint shall be raked out 10 mm deep as the work proceeds to form an adequate key.

Galvanised steel ties with fishtailed end cast into the concrete spaced at alternate courses and extendingnot less than 150 mm into the block joints. All mortar joints are not to exceed 15 mm or less than 12 mm.

Lintels

Concrete lintels shall be used for all openings and shall be reinforced with two 12 mm high yield steelbars. Lintels shall have a minimum bearing of 500 mm at the ends.

Structural Steelworks Switchgear building

Structural steelwork shall be shop-fabricated from structural shapes of medium grade carbon steel in suitable lengths for easy transport and erection. The structural members shall be jointed or fixed on site by bolting or welding. Site welds should be minimised. Design shall comply to BS 5950.

All workmanship and fabrication shall be in accordance with the best practice and shall generally comply with the requirements of B.S. 449. The greatest accuracy shall be observed to ensure that all parts fit together correctly on erection within the tolerances stated in this

section. Steelworks shall include all materials, bolts and attachments, cleats, brackets, gussets, etc.

Where required in the Contract, the Contractor shall design the steelwork to comply with the information given on the Contract Drawings. Loading and factors of safety shall comply with relevantcodes and regulations. Shop drawings shall be prepared using welding symbols to B.S. 499 where appropriate. Design calculations and shop drawings must be submitted to the Project Manager for hisapproval prior to fabrication of members. The approval of shop drawings and calculations by the Project Manager shall not relieve the Contractor of the full responsibility for any discrepancies, errors,omissions or failure arising therefrom.

All steelwork shall be transported, handled, stored on Site and erected so that members are not damaged or subjected to excessive stresses. Fabrication and erection shall comply with B.S.5950 Part 2

Roofing

Materials, accessories and fixings shall be ordered from an approved supplier and the Contractor shallas and when required by the Project Manager, submit and deliver samples of nay materials for inspection and testing. Roof trusses shall be in steel.

Roof sheeting shall be hot dip galvanised troughed mild steel sheeting of IT5 profile or similar approved by the Project Manager. They shall be of minimum thickness 0.5 mm. The sheeting shall have approved plastic coating on face side. Type and brand of such sheeting shall be proposed by the Contractor with his Tender together with supporting specifications. Insulation sheeting will be laid before installation of roofing sheets.

The sheets shall be laid with 200mm end laps and double corrugation side laps away from the prevailing wind. The sheets shall be fixed to light gauge steel purlins with galvanised coach screws and seating washers.

Holes for screws shall be carefully drilled in the ridges of the corrugations and J-bolts used. Great careshall be exercised to avoid damage and disfiguration to the surface coating of the sheets. At eaves andexposed edges the corrugations shall be closed with purpose made corrugation closers.

Maximum load acting on the building in accordance with local or regional standards.

Roof trusses shall be held in place with a base plate 12mm thick minimum with 4no. 20 diameter bolts(minimum) and of 300mm length minimum. The contractor shall provide eaves of not less than 1.2mon all four sides of the building, otherwise provide canopies above doors and windows on gable sides.

The Contractor shall provide the methodology on roof assembly. The contractor shall provide an insulation sheet of minimum 10mm thick with specs as approved by the Project Manager, and which shall be installed below the roofing sheets.

The joints for members of the truss shall be reinforced with gusset plates. The roof layout shall have wind bracing and anti-sag rods. The anti-sag rods shall be installed in a staggered arrangement.

Switchgear building - ceiling

The switchgear building is to have ceilings consisting of fore-manufactured sheets, mounted on steel grids jointed to roof structures. The ceiling shall be fireproof. If gypsum, the boards

shall be of minimum 12mm thickness and shall have cornices.
The ceiling shall have an escape hatch in the office and in the washrooms. The contractor shall providea ladder for maintenance within the Control Building. The external soffit shall be finished with T1G, light gauge steel or aluminium.

Roof Drainage

Gutters and down pipes shall, unless otherwise shown on the drawings, be approved plastic coated steel or heavy gauge PVC of diameters 200 mm and 150 mm respectively. One down pipe shall be provided for approximately every 50 m2 roof area.

Downpipes to be connected to the water harvesting system/tank, otherwise the contractor shall providecatch pits connected to the main storm water drainage system.

Joints shall be lapped 150 mm in the direction of the flow and soldered. Slip joints shall be provided to allow for expansion. All hangers, brackets, and fastenings should be of the same metal as the gutteror of compatible materials. Gutters and down pipes including supports shall be designed for a concentrated load of 100 kg. Screens or strainers shall be provided to prevent debris from clogging the down pipes.

Metalwork

Unless otherwise specified, metalwork shall be carried out in accordance with the provision of B.S.5950 and other relevant BSI standards.

All steel shall unless otherwise specified, be hot dip galvanized.

Prior to fabrication the Contractor shall submit shop drawings to the Project Manager for approval.

Metal Doors

c) General

Metal doors shall be supplied by approved manufacturers.
All doors shall be painted as specified under Painting and Decorating. All locks shall be master-keyedwith three master keys supplied in addition to three regular keys for each door or gate.

Doors shall be measured by the number of doors of specified dimensions. The rate shall include allsupplies, site works, painting and hardware.

d) Doors

Door frames shall be pressed steel frames made from minimum 2 mm thick steel sheeting andreinforced where door closers are fixed.

The main door shall have a latch provision to accommodate the Project Manager's Standard Padlock.Thresholds shall be made from rolled steel sheeting approximately 100 mm wide and 12 mm high.

Door shall be filled with mineral wool acoustic insulation and lined both sides with steel sheeting minimum 1.25 mm thick. Total thickness of door shall be 45-55 mm.
All doors shall have fire rating Class A30.

Placing of doors in accordance with Switchgear building drawing.

Internal door frames are to be built to walls truly vertical and square with six-ties per frame.

External door frames are to be built in to walls truly vertical and square with eight/ten ties per frame.
All door frames are to be from an approved manufacturer and illustrated in the Manufacturer's Catalogue.

Door frames are to be complete with 100 mm, loose pin steel hinges welded in position and adjustablestriking plate.

Frames shall generally be built-in during construction of the walls and securely fixed. A gap shall be left between the top of the frame and the soffit of the lintel during construction. Frames shall be adequately strutted to prevent distortion and shall be protected from damage during other work.

Door frames and similar components shall be fixed with countersunk screws or bolts with heads set into the frames.

Walls shall be built as close as possible to the frames and the gap filled solid with mortar at each course. Render shall be neatly brought up to the frame and well tamped into any remaining cavities. The junctions between window frames or external door frames and external finish or block work shallbe caulked tight with approved mastic or mortar wherever required, and neatly pointed. Mastic so usedshall have long-term resistance against weather, insects and ultra-violet light.

Doors wider than 800 mm shall have three 100 mm hinges. Other doors may have two hinges except where specified or detailed otherwise.

Door stops shall be fitted by screwed fixings where necessary.

Entryways

Entry to rooms with panels and equipment shall be via ramps. These ramps and steps where necessary,shall be of reinforced concrete.

Aluminium or Steel Windows

Unless otherwise indicated windows shall consist of aluminium sub-frame with clear glass. Windowsshall be from an approved supplier and the details thereof shall be approved by the Project Manager. Windows shall be operable and provided with corrosion resistant metal insect screens or as directed by the Project Manager.

Frames shall generally be built-in during construction of the walls and securely fixed.

Placing of windows in accordance with Switchgear building drawings. Widows are to be built in towalls truly vertical square with six-ties per frame.

All aluminium or steel windows are to be from an approved manufacturer and illustrated in the Manufacturer's Catalogue. The aluminium window frames shall be blue and of minimum 2.5mm thickness. Window panes shall be of minimum thickness 6mm thickness which is shatterproof.

Windows are to be fitted complete with casement fastening, stays etc.
All windows shall have approved burglar bars, and approved means of opening/locking.

Door and Window Furniture

Ironmongery shall be strongly made, well finished, good quality "stock pattern" articles.

Ironmongeryfor windows and doors shall be galvanised or other approved manufacture for external use. Samples of all items shall be submitted to the Project Manager for approval before they are used for the Works.

All doors shall be lockable. External doors shall have approved security locks.

Three keys for each lock, clearly labelled, shall be handled over to the Project Manager and all ironmongery shall be cleaned, oiled, adjusted and left in perfect working order.

Emergency doors shall be provided accordingly as per the safety requirements.

MV Switchgear Room

Openings for pressure release: In the MV switch-gear room it is necessary to arrange for openings forpressure release in case of explosion in one of the switch-gears.

To avoid damage in the room/building any pressure shall be released through the openings as described.

Location of these openings must be beneath the ceiling on both longitudinal walls in the switch-gear room. The Contractor must calculate number and size of this pressure openings, and submit his proposal for approval.

Sufficient number of MV cable ducts through MV switch gear room wall joining the switchyard MV cable trenches shall be provided. The size of these ducts shall be big enough to accommodate Single core 630mmsqr MV cables. The position and number of the ducts shall discussed and approved by theproject manager. Spare dust shall be sealed to prevent entry by vermin.

6.7.2Switchgear/Control Building

Table 6.7.1 Schedule of Materials and Finishes

Room	Floor	Walls	Ceiling	Remarks/Notes
All Rooms	Terrazzo	Plastering/ painting	Sheet/plate-fire resistant	Sheets for ceilings = Prefabricated/ manufactured colour and type in accordionwith approval of the employer. Switchgear building: External/internal colour in accordance with approval of the employer

6.8 PLASTER AND FLOOR COVERINGS

Materials

Cement and water to be as before described. The sand to be screened through a sieve of 10 to 15 andmeshes to 1 cm and to be washed if directed.

Mixing

All materials for mixing are to be used in proper gauge boxes and they are to be strike measured and not tamped down in boxes. Proper non-absorbent stages are to be used for mixing and storing mortar.No foreign matter must be mixed with the mortar.

The materials are to be mixed dry before adding water through a fine hose spray. No cement mortar which has taken its initial set will be allowed to be used.

Plaster Thickness

Unless otherwise specified all wall plasters should not be less than 13 mm thick and not more than 19mm thick.

Cement Plaster

Cement plaster for external use to be composed of one part cement to four parts sand and for internaluse to be one part cement to five parts sand.

Form Key

Rake out joints and roughen if necessary to form key for plaster.

For concrete surfaces, hack and apply 1:1 cement sand slush to form key. Continuously wet for 7 daysand then apply plaster.

All brickwork and concrete works should be brushed down to remove dust and any other loose material.

Wetting

All internal and external brick or concrete surfaces are to be wetted well before plastering. All cement plaster must be kept wet for at least 7 days.

Repairing Defects

All defective plaster, cracks, hollows, etc., are to be cut out to a rectangular shape, the edges undercutto form a dovetail key and to be made good to finish flush with the edge of the surrounding plasterwork.

All patches will be to the approval of the Project Manager and if the defects cannot be made good satisfactorily then the whole surface is to be removed and re-plastered at the Contractor's expense.

6.9 GLAZING AND PAINTING

Glass

All glass is to be of approved manufacture, free from bubbles, waviness, scratches or other imperfections and is to be well bedded, puttied and back puttied and secured with glazing pins or clipsin steel sashes or with sprigs in wood sashes.

All glass shall be carefully cut to the required sizes so that all panes of figured or textured glass are uniform in appearance with the pattern parallel to the edges and wired glass shall be so cut that the wires are parallel to the edges.
The window glass for switchgear room shall be shatterproof type.

Putty

Putty for glazing to steel sashes is to be of approved proprietary brand. Rebates are to be thoroughly back puttied before glazing and all putty is to be carefully trimmed and cleaned off so that back puttyfinishes level with the top of sections internally, external putty covers sight lines exactly and finishedstraight and true. Rough surfaces to putty will not be allowed and any defective putty will be cut outand replaced at the Contractor's expense.

Rebates of wood sashes are to be given one coat of priming immediately before glazing.

Mirrors

Glass mirrors are to be of the thickness specified, of selected quality glass, silvered on back, withprotective sealing coat and erased edges, unless otherwise described.

Generally

Allow for removing and replacing all cracked, broken or defective glass and leave thoroughly cleanand perfect at completion.

Materials for Decoration

All paints, primers, varnishes, emulsions, stopping, etc., to be of approved manufacture. The contractor is to use proprietary ready mixed paints obtained from an approved supplier.
When a coat of proprietary paint is applied, the manufacturer's priming and previous coats suitable forthe particular type are to be used.

All materials must be brought on to the site in unopened tins, and no dilution or adulteration will bepermitted, unless approved by the Project Manager.

Emulsion Paint

Emulsion paint shall be PVA (Polyvinyl Acetate) alkali-resisting formulated with high washability and capable of resisting 8000 scrub test. The first coat to be specially formulated base coat for directapplication to the specified surface.

Fillers

Higher grade cellulose fillers are to be used internally and premixed filler to be used externally.

High Gloss Paints

Primers for application to bare metal to be red oxide primer for iron and steel. For galvanised metal to be an approved zinc chromate or galvanised iron primer. For application on wood or plaster etc., to be an approved alkali primer.

Finish enamels

Finish enamels to be synthetic enamel high-capacity paint with high coverage and high gloss finishunless otherwise described.

Workmanship

All surfaces are to be free from moisture, dust, grease and dirt and rubbed down smooth according toapproved practice.

All plaster to be free from efflorescence and treated with one coat of petrifying liquid, approved sealeror alkali primer if required. Hard wall plaster to be glass papered before decorating.

Rectifying defects to decorated surfaces due to dampness, efflorescence, chemical reaction, etc., will be to the Contractor's account, as these surfaces must be checked and the appropriate precautions takenbefore applying the decoration.

Metalwork must be scraped free of rust, primed as described and finished as later specified.

Galvanised sheet iron, pipes, etc., are to be cleaned down to remove manufacturer's ammoniated dichromate protective covering, primed as described and finished as later specified.

Coated pipes are to be cleaned down, stopped and primed with one coat of aluminium primer and finished as later specified.

All knots in woodwork to be treated to prevent bleeding. Large or loose knots to be cut out

and be replaced with sound wood, or cut back and filled. Small knots to be treated with two thin coats of Shellac in methylated spirits. Woodwork to be glass papered to a smooth surface with all sharp arrisesremoved, all cracks, crevices, holes, etc., to be scraped out, primed as described and stopped with hard stopping, faced up and rubbed down to an even surface and finished as later specified.

All metal and woodwork to have the specified number of coats in addition to the priming coat.

Every coat of paint must be a good covering coat and must dry hard and be well rubbed down to a smooth surface before the next coat is applied, otherwise the Contractor will be required to apply extracoats at his own expense.

Each coat of paint to be of a distinctive colour: sample colours are to be prepared for the final coat which is to be an approved colour scheme and must not be applied without the permission of the Project Manager. After undercoats are on, the painter shall check all work and grain fill as necessarywith filler as described.

NOTE:

a) All paints specified are to be obtained from an approved manufacturer and used in strict accordance with their instructions. Their representative will check the paints being used and the method of application and will advise accordingly.

b) This section of the work to be carried out by an approved firm of decorators who must allowfor the very best finish possible and of the highest quality obtainable.

c) The prices must allow for the removal and refitting of all beads, fittings, fastenings, ironmongery, etc., removed for decoration purposes to be carried out by skilled tradesmen of the appropriate trade.

6.10 SUBSTATION BUILDING SIZES.

Proposed substation control buildings should be in conformity with relevant building codes with regard to room size and safety. The building must meet the requirements described in the scope of work and take into consideration future expansion. The minimum Control/Switchgear building area for a substation without indoor switchgear shall be 120m Sqr, for the ones housing indoor switchgearand GIS shall be 450m Sqr. Specific requirements of the building are described in clause 6.1.2

6.11 IRONMONGERY AND METALWORK

General

All ironmongery shall be of the best respective types required and no alternative articles will be accepted unless approved. Articles described as brass must be solid brass and not brass finish. Chromium plated articles must be plated satin finish on solid brass or other approved metal.

Where items for ironmongery are required to be fitted to steel door frames, etc., the Contractor must ensure that the Manufacture makes provisions for the correct fitting or lock striking plates, hinges, cleat holes, bolt keeps, etc.

Locks and Keys

Locks are to be two levers unless otherwise described. All locks are to be provided with two

keys which must be handed over to the owner on completion of the Works with identification labels attached.

Steel

Steelwork for general building construction is to be of approved manufacture complying generally with the appropriate British Standards and free from all defects, oil, dirt, loose rust, scale or other deleterious matter.

6.12 ELECTRICAL INSTALLATION

Scope of Works

This section of the specification relates to the supply, installation, testing and commissioning of the complete electrical services within the switchgear building, including:

1. LV Switchgear
2. Lighting
3. Small Power

The switchgear building consists of a switchgear room.
The Employer reserves the right to reject any of the contractor suppliers if he feels the product does not meet with the contract specification.

Electrical Services General Description

The complete electrical installation shall comply with all local standards and rates.

Should there be any conflict between local standards and what has been specified the sub-contractorshould draw it to the attention of the Project Manager.

Lighting

a. Luminaries shall be fluorescent lamps except for the toilets and outdoor lighting (exceptswitchyard and perimeter lighting) where GLS lamps can be utilized. In switchgear room: 250 lux is required. In offices 500 lux is required.
b. All luminaries shall be supplied, installed and tested by the electrical sub-contractor.
c. All metal work on the luminaries shall be connected to an insulated earth protectiveconductor.
d. Lighting Control Switches
e. Outdoor lighting shall be controlled from an automatic timer control system.
f. Lighting control switches shall be flush pattern with white finished plates.
g. Grid switches shall have 5 or 10 amp rating, generally where fluorescent discharge luminaries are controlled switches have 10Amp rating whereas with low energy PL lamp, 5 amp switches shall be installed.
h. Provide emergency lights both inside and outside the building on each side.
i. Provide security lights with solar backup system.

Socket Outlets and Accessories

Reference should be made to the Standards given above for details on the socket outlets andaccessories.
Socket outlets to be mounted at 300 mm above floor level.

Conduit cast into the building structure shall be of the heavy duty PVC type. PVC conduits shall notbe fixed to the surface of the structure.

AC Installation

The Contractor shall supply and install at least six (6) number AC units including wiring and insulatorfor the unit.
The design for these AC units shall be done by the contractor and approved by the Project Manager.The design shall take special consideration for projects in coastal or high humidity areas.

The external AC unit drain ducts shall be directed to main drain and should not drain to the buildingapron.
Wall mounted extractor fans shall be provided in the battery and washrooms.

Battery bank room

The room shall have an independent door opening to the switch yard, and shall have no inter connecting alley between this room and rest of the switchgear/control room.
It shall also be installed with 2no. Exhaust fans for blowing battery fumes out of the room, one workingand one on standby. They shall be composed of a non-sparking wheel construction and motor shall beexplosion-proof type. Fans shall be wall mounted axial type with back draught dampers.

Doors shall have applicable fire and security rating. Walls shall be protected against electrolyte splashing by applying an approved light-colored and resistant enamel paint. OSHA 1925.4.03 (A) General Requirements shall apply.

The battery room shall be provided with a tap and sink with cold water supply. Heavy duty PVC pipesshall be used instead of cable trench and they must not be on flush level with the floor (minimum 50mm off and above the floor).
Appropriate signage shall be provided outside the battery room. Appropriate PPEs for maintenance and handling of the batteries shall be provided. Racks and trays shall be designed for and provided. These shall be treated for resistance to electrolyte.
Floor finish shall be an approved acid-resistant epoxy coating applied as per approved manufacturer'sspecifications.
Lighting luminaries within the battery room shall be explosion-proof. The design shall consider that all possible sources of ignition (including arch*, sparks and excessive surface temperature can be controlled and the probability of explosion reduced to acceptable low levels.

Fire Safety Facilities

Portable fire extinguishers shall be provided under this Contract. Portable, wall mounted, hand held extinguishers shall be 9.5kg pressurized control discharge BCF units. The number of units within theSubstation shall have a minimum of 6 Number fire extinguishers.
The body of the extinguisher shall be seamless, welded and brazed as appropriate.
The extinguisher shall be capable of being released by means of a lever-operated valve provided witha safety pin.
Extinguishers shall be capable of controlled partial discharge. The type shall be of that recharge unit that is locally available.

The extinguishers shall be walls mounted and attached and located in a manner affording quick releasefrom the supporting bracket. They shall be installed so that the top of the extinguisher is not more than 1.5meters above the floor. In no case shall the clearance between the bottom of the extinguisherand the floor be less than 0.1 meter. The extinguishers shall be

positioned so that the instructions foroperation face outwards.
All instructions and labels shall be in English. Fire extinguishers shall be provided in the Guardhouse.Two fire extinguisher (foam) shall also be provided at the control building on the side facing the switchyard.
The building shall also be fitted with **fire & smoke detection with alarm reporting function via Scada**. The contractor to train the local staff on use of the installed system. The system shall be monitored from remote Regional Control Centers.

In the cable trenches, fire retardant approved by the Project Manager shall be used at junctions of cabletrenches and sprayed on the cables. Reinforced Concrete firewall shall be provided between equipmentand the control building and/or transformers that breach the relevant clearance allowed. Design for thefirewall to be done to BS 8110 with special consideration for fire rating.

Steel Structure
All steel structures to be hot dip galvanized formed steel as per British Standards

- All steel supporting structures for equipment to be tubular
- Gantry to be Lattice angle channels.

PARTICULAR TECHNICAL SPECIFICATIONS FOR 33KV and 11KV OVERHEAD LINES

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7 PARTICULAR TECHNICAL SPECIFICATIONS FOR 11KV LINES

7.1 General

The Bidder shall examine the scope of works in this section in close connection with the other documents and particulars forming these Bidding Documents.

Special attention shall be paid to Technical Specifications, in which the general technical requirements are specified. The drawings enclosed in are for bidding purposes only.

If the Specifications and/or Drawings do not contain particulars of materials or goodsthat are necessary for the proper and safe completion, operation and maintenance of the equipment in question, all such materials shall be deemed to be included in the supply.

In the event of any conflict between the Drawings and the Specifications, the latter shall prevail.

In the event of any conflict between scaled dimensions and figures on the Drawings, the figures shall prevail.

Should the Bidder find discrepancies in or omissions from these Specifications or fromthe other Documents, or should he be in doubt as to their meaning, he should immediately contact the Project Manager for interpretation, clarification or correctionthereof before submitting his Bid. Such action shall, however, in no case be consideredas a cause for altering the closing date of the Bid.

The scope of work covers supply of equipment, engineering and design, manufacture,testing before shipment and packing sea worthy or otherwise as required, delivery of all equipment CIP site, construction and installation and commissioning.

Where the new line share the route with existing lines, the scope of work shall includeall the necessary works/modifications that will be required to accommodate the lines along the same route. The hardware/fittings and conductors of the existing lines shallbe re-used.

The term "reconductoring" in this scope of works shall mean supply of new conductors, new hardware/fittings and new poles as well as installation of this in the existing line routes. It also includes moving all equipment, such as distribution transformers, auto-reclosers, switches and links, capacitor banks etc., attached to the present poles over to the new poles. All existing poles, conductors and hardware/fittings shall be recovered and handed over to the at locations to be informed.

<u>Cross arms:</u>
Steel cross-arms shall be used in all cases including re-conductoring (where required)

Poles:
Concrete poles shall be used in all cases.Shield Wires:

Where OPGW is not installed shield wires (Aerial earth wire) shall be used in all the 66kV and 33kV Lines. The standard size used by is 25mm^2.

7.1.1 Nature and Extent of Work

The work covered by this Specification forms part of the 's Distribution capacityenhancement Project and is for design, survey, supply, installation and commissioningof new 33 and 11KV Overhead Lines as specified herein and in the Attachments. Theoverhead lines will form part of 's transmission and distribution networksystem.

The new lines are expected to run in parallel with existing 33 or 11/0.43KV lines, butdue to constraints in way leave in some areas/section of the lines, in such places the existing line structures/poles shall be modified to carry both 33/11kv lines. Where existing line is on wooden poles the wooden poles shall be replaced with Concrete poles.

The Contract Works to be supplied shall be carried out by the Contractor in accordance with the Specification and Condition of Contract and shall comprise the following:

Three-phase overhead distribution lines having the technical particulars set out in theTechnical Schedules and Drawings attached to the Specification, the lines being complete with the survey, line conductors, insulators and fittings, poles and cross arms, Earthing (where required) and connections, and all other fittings necessary to have a complete distribution line.

7.1.2 Design

The following drawings shall be submitted by the Contractor according to the timeschedule for approval:

- Detailed route maps
- Longitudinal profiles
- Tables showing the capacity of the poles related to wind and weight span for theactual conductor sizes
- Sag tables for the actual conductor types for stringing conditions and includedcompensation for creep
- Erection drawings for insulator sets, fittings and cross arms
- Pole foundation

7.1.3 Factor of Safety

The minimum factor of safety at assumed maximum simultaneous working loadingshall be as follows:

i) Line conductors based on ultimate
   strength Max tension 3.0
   Everyday stress 5.0
ii) Insulator and fittings, based upon electro-mechanical test and minimum failingload

Insulators and insulator fittings	2.5
Dead-end clamps and conductor fittings	2.5

iii) Steel structures, bolts and other steel pole members based on elastic limit oftension members and on crippling loads of compression members:

Steel Structures (Including steel cross arm)	2.5
Bolts, nuts and washers	2.5

iv) Supports, stays and cross arms subjected to the longitudinal transverse andvertical loads resulting in the lading conditions stated above:

Wood supports and cross arms	3.5
Concrete structures	2.5
Steel supports and cross arms	2.5
Stay assembly and fittings	2.5
Foundation – Concrete	2.5

7.1.4 Working Conditions

The maximum assumed working conditions shall be as follows:-

i) Minimum temperature of line 5°C
ii) Ambient temperature of line conductor 35°C
iii) Maximum temperature of line conductors 80°C)
iv) Wind pressure on the whole projected area of conductors 400N/m2
v) Wind pressure on projected are of insulator 400N/m2
vi) Wind pressure on projected are of support 400N/m2
vii) Altitude: 0 – 2200 meters above sea level.

7.1.5 Clearances and Spans

7.1.5.1 Medium overhead lines minimum clearances at operatingtemperatures:-

i) Lines not exceeding 11kV across or along road: 5.8m (19ft)
ii) Lines not exceeding 11kV over private land: 5.2m (17ft)
iii) Lines not exceeding 33 kV over private land: 5.8 m
iv) Lines not exceeding 66kV over private land: 6.2m (20ft)

7.1.5.2 Additional Clearances

i) 11 kV line conductor to any part of the building: 2.7m (8ft. 8 inch).
ii) 33 kV line conductor to any part of the building: 5.0m
iii) 66 kV line conductor to any part of the building: 7.5 m

7.1.5.3 Special Clearances

a) Railway crossing clearances

i) All types of line including guard nets – 8.1m (30f)
ii) The minimum clearance of any pole or structure from the centre of a tract shallbe the height of the pole above ground plus 2.1m (7ft).
iii) Where the tract is in a cutting, no such pole shall be closer to the edge of thecutting than a distance equal to the height of the pole.

b) Kenya Posts and Telecommunications Installation Clearances

i) Guard net – 1.3m (4ft)
Up to 66kV conductors using cradle guard–1.8m (6ft)
ii) Angles of crossing
Medium voltage, not less than 60°

7.1.6 Environmental Requirements

The Contractor shall undertake to complete all works in accordance with statutory requirements including those of:

i) The Kenya Wildlife (Management and Conservation Act) Applicable for all works inside National Parks.
ii) The Kenya Agricultural Act - Concerning protection against soil erosion.
iii) Public Health Act – Concerning with noise, water and air quality as they relateto human health.
iv) Chief Authority Act – Concerning the regulation of timber cutting and wastefuldestruction of trees and avoidance of damage to the public road or other community facilities.
v) The Local Government Act – Section 145 for preservation or protection of wildlife and Section 163 regarding noise disturbance controls.

The Contractor shall take reasonable precautions to avoid damage to land, property, crops, etc. and shall ensure that the work is adequately supervised so that damage is reduced to the minimum. All surplus material shall be removed after erection and siteshall be left in a clean and tidy condition, to the satisfaction of the Purchaser.

Where the Contractor considers that damage cannot be avoided if the work is to proceed normally he shall notify the Purchaser accordingly. The Purchaser will coordinate and facilitate assistance with the landowner concerned during negotiations for compensation. The Contractor will be responsible for compensation in respect of damage and the Contractor shall proceed with the work within the limits indicated bythe Purchaser.

Where temporary removal of bound, wall or similar obstacles is necessary for the purpose of foundation installation or support erection, the cost of removal and subsequent reinstatement shall be deemed included in the Contract rates for foundationand support erection.

Where it is necessary to provide scaffolding over roads, railways or telecommunication lines in order not to interfere with the passage of traffic, this shallbe carried out by the Contractor at such times as may be convenient to the Authority concerned. Flagman and approved types of danger and warning notices shall be provided by the Contractor to ensure safety of the public.

7.1.6.1 Way leaves

Way leaves shall be provided by the Purchaser to enable the Contractor to carry out the Works. In order to provide way leave the Purchaser has to obtain approvals from Government and other statutory authorities, and also consents from owners and occupiers of property which will be affected by the lines.

The procedure for obtaining approvals and consents is dependent on preliminary profile survey, as described below:

a) Representatives of the Purchaser will accompany Contractors staff during preliminary survey. The Purchaser's representatives will issue notices to and liaisewith landowners and occupiers in order to establish rights of entry for survey and agreement to limited cutting of vegetation as specified.

b) Upon approval by the Purchaser of preliminary survey the Purchaser will initiate procedures for obtaining way leave, and when necessary approvals and consents have been granted the Purchaser will arrange for trees etc. to be cleared from the line route as specified.

c) Upon approval by the Purchaser of the position of support centre pegs theContractor shall submit access maps as specified and the Purchaser will obtain thenecessary rights of construction access for the Contractor.

d) Way leaves procedures as described above will take place concurrently with profile survey, approval of centre pegs, etc. The Contractor shall allow in his programme for a period of up to two months from approval of preliminary lines tothe grant of right of access for its construction.

e) Any conditions for the way leave should be made known to the Contractor.

f) The way leave procedures shall lead the construction programme for each sectionof the Contract.

7.1.7 Standards

Unless another standard is mentioned in this Specification, all materials used and provided under this contract and all services performed must be in accordance with the latest amendments of the Standards of the International Electro-technical Commission (IEC) or British Standards (BS), applicable Kenyan Standards and the attached Material Specifications.

Suppliers who do not normally manufacture to IEC or BSI Standards may offer equipment in accordance with other recognized national Standards provided that theydraw attention to any essential differences between their Standards and IEC/BSI Standards and Subject to the satisfaction of the Employer that the quality, finish and performance of the equipment complying with such standards shall be comparable tothat complying with IEC or BS.

7.1.8 Units of Measurements

SI units (System International) shall be used in all the technical schedules and drawings.

7.1.9 Materials

Each of the several parts of the line shall be of such construction and design as to give long and continuous service with high economy and low

maintenance costs.

All material used and equipment provided under this contract shall be new and of thebest quality and workmanship and shall be of the highest class throughout with the designs and dimensions of all parts such that mechanical and electro-mechanical stresses which they are subjected shall not render them liable to distortion or damage under most severe conditions encountered in service. Repair of any defective parts shall not be permitted without the sanction in writing of the Project Manager.

The detailed design shall be carried out in manner to facilitate inspection, repairs and simplicity of operations and maintenance. All materials shall ensure satisfactory operations under the atmospheric conditions prevailing in the area where the lines areto be built, irrespective of season and under such variations of load and voltage as mayoccur under working conditions of the system. Line supports, conductors, insulatorsand fittings shall be such as to minimize the risk of damage due to deterioration, or damage in service of any part of the line. The design shall incorporate any reasonableprecaution and provision for the safety for those concerned in the maintenance of the Contract Works and all associated works supplied and executed under other contracts.

All corresponding parts shall be made to gauge, shall be inter-changeable wherever possible throughout the Contract Works and are to be such as will facilitate the fittingof replacement.

7.1.10 Line Supports and Foundations

The network shall be supported on wood poles, however alternative supports such as concrete and steel structures may be considered. The wood poles shall meet specifications set in Kenya Power and Lighting Co Ltd: Specification for Wood Poleand Kenya Standard KSO2-516: Poles for power and telecommunications lines. The concrete poles shall meet the specifications set in Kenya Power and Lighting Co. Ltd; Specifications for Concrete Pole Kenya Standard DKS 1933.

The poles can be of single pole type or H-pole type, with or without stay wires, with insulator chains or pin or post insulators, depending on the actual conditions and the approved design.

7.1.10.1 Physical and Mechanical Properties of Wood poles

The wood poles (Eucalyptus Salina) used shall have the following properties:-

Nominal length	10	11	11	12	12	14	14
Category	Medium	Medium	Stout	Medium	Stout	Medium	Stout
H(mm)	1.8	1.8	1.8	1.8	1.8	2.0	2.0
D_c(mm)	220	230	295	240	305	248	310
D_m(mm)	150	160	200	160	200	160	200
D_g(mm)	220	230	295	240	305	270	335
D_e(mm)	175.9	185.6	234.8	189	238.1	199.4	248.4
F(kN)	5.90	4.94	13.05	4.03	10.37	3.45	8.23
Ultimate load (kN)	8.64	8.73	18.42	8.89	18.24	10.46	20.02
Crippling load (kN)	59.4	58.6	149.8	51.2	128.9	45.9	110.3

H Ground position from butt

d_c Critical diameter

d_g Minimum groundline diameter (mm)

d_m Minimum top diameter (mm)

d_e Effective diameter

f Load per mm of deflection at point of application of load

Note that the mechanical properties used in the mechanical calculations are those statedin the Kenya Standard KSO2-516.

7.1.10.2 Strength and Species

Wood poles shall be of eucalyptus timber and shall belong to the strength groups Light, Medium or Stout as specified. The treatment shall be creosote pressure-treatedwood, or Chromated copper arsenate (CCA).

7.1.10.3 Pole Caps

Pole caps of approved type shall be used.

7.1.10.4 Safety

All poles shall have a DANGER/HATARI warning plate, placed at a visible point in the pole at a height of 1.7m and legible from a distance of at least 2m.

7.1.10.5 Excavation

The hole for the pole shall be excavated to a minimum of 1.8m for the 11m pole. If the base of the hole is not firm ground, the hole shall be excavated until firm groundis reached, otherwise the pole has to be placed on a flat rock block, min. 40 x 40 cm or a timber raft, min 80 x 80cm. depending on the

conditions.

The minimum hole depth for wood poles shall be defined in the table:-

Pole Height H (m)	Size	Hole Depth Minimum (m)
10	Medium	1.6
11	Medium	1.8
11	Stout	1.8
12	Medium	2.0
12	Stout	2.0
14	Medium	2.2
14	Stout	2.2
15	Stout	2.4
17	Stout	2.6

The hole shall be dug to the required depth. Any holes left overnight must be coveredin such a way that they do not pose any danger to persons or animals. A suitable method of warning shall be used to identify positions of the holes.

7.1.10.6 Erection

The butt of the pole is laid over the hole with the length in the direction of the line. Askid board is placed against the hole to facilitate the entry of the butt when the pole israised and prevent earth breaking into the hole during the process of erection.

Erection of the poles shall be done using any of the following methods:

i) Erection ladders
ii) Truck mounted hydraulic lifts

iii) Guy ropes shall be used to prevent accident and to hold pole in a true vertical position. The pole is gradually raised to the vertical position and the butt guided in to the hole.

7.1.10.7 Pole Dressing

Partial dressing can be done while the poles are lying on the ground; in this case caremust be taken during erection to avoid the fittings being damaged. The fitting of the insulator shall be done after the pole has been erected.

7.1.10.8 Back Filling

After erecting the pole and positioned it vertically, the pole shall be secured in this position by help of stones blocks placed in 2 or 3 layers, one layer at the bottom of thehole, and one to two layers at the top. The stones shall fill out the area between the pole and the wall and will secure that the pole remains vertical during the pole's lifetime.

Between the layers of stone and above the top layer, the excavated soil can be used asbackfill material if the origin soil is appropriate for tamping.
The soil should be wet and backfilled slowly and each layer thoroughly tamped until the tamp makes a solid sound as the earth is stuck. Each tamping layer should not exceed 150 mm. If small stones or gravel are readily available,

these should be mixedwith the soil used in backfilling.

In areas where the ground is unsuitable for firm erection of poles i.e. swampy areas with black cotton soil etc the pole has to be placed on a flat rock block or on timber raft as described under Excavation on previous page. It may also be necessary to change out the soil material around the pole.

7.1.10.9 Design, Materials and Construction of Concrete Poles

The concrete poles shall be designed and manufactured in accordance with Kenya Standard DKS 1933.

The poles shall be round, Prestressed or Reinforced Concrete Poles as per DKS 1933.

The materials used shall be in conformity with the design standard (DKS 1933) and shall be selected to suit intended application.

The pole shall be so designed that its strength in transverse direction shall be sufficientto take the load due to wind on conductors, fittings and the pole.

In accordance with Annex A of DKS 1933, the aggregates used in the manufacturer pf the pole shall be free from veins and adherent coating and free from injurious amount of disintegrated pieces, alkali, vegetable matter and other deleterious substances. As far as possible, flaky, sconaceous and elongated pieces shall beavoided.

The surface of all reinforcement shall be free from loose scale, oil, grease, clay or other material that may have deleterious effect on the bond between the reinforcementand concrete.

The mix design, mixing and compaction of the concrete shall be such that the necessary strength in the pole is obtained after curing in accordance with DKS 1933.

Concrete shall be compacted by vibration, centrifugation or other efficient means. Hand compaction shall not be permitted.

The finished pole shall have a smooth external surface that is free from honeycombing.

A quarter (¼) of the poles supplied for each consignment shall incorporate an integral Earthing system comprising a non-stressed internal Earthing copper conductor (at least 70mm² stranded conductor) running the length of the pole and the ends of the conductor shall be left projecting from the pole to a length of 100mm at 200mm fromtop and 150mm below ground level. Manufacturer may offer alternative suitably designed Earthing termination for consideration.

7.1.18.1.1 Physical and Mechanical Properties of Concrete Poles

The concrete poles shall conform to the following standard sizes:

Nominal Length (m)	Top Diameter (mm)	Working Load (kN)	Ultimate Load (kN)	Strength Class (as per DKS 1933)	Minimum Depth in Ground (m)
10	190	2.5	5	50	1.8
11	190	2.5	5	50	1.8
12	190	3.0	6	50	1.8
13	190	3.0	6	50	2.0
15	190	3.0	6	50	2.1

The required safety factor is 2.5 and pole taper for the Pre-stressed Concrete Pole shallbe at least 13mm per meter.

Poles shall be supplied complete with suitably designed fittings for conductor and staywire characteristics.

7.1.18.1.2 Marking

Each concrete pole shall be marked permanently by impressing on the pole (or by useof a permanently secured plate) at a position 1.5m above the pole Ground line with thefollowing details:

- Manufacturer's name
- Date of manufacture (mm/yy)
- Length of pole (meters) and Tip dimensions (mm)
- Ultimate/Working load/Strength Class
- Type of pole
- Weight of pole
- Standard to which the pole complies
- The words "PROPERTY OF KAA"

Ground line reference mark shall be conspicuous on the pole.

Where a plate is used it shall be made of stainless steel, securely affixed to the pole. Inall cases the lettering shall be not less than 5mm high legibly impressed.

7.1.18.1.3 Bolts Nuts and Washers

All bolts and nuts shall confirm to BS 4190 and shall preferably have screwed threadsof I.S.O. form. Nuts and heads of all bolts shall be of the hexagonal type. All bolts and screw rods shall be galvanized including the threaded portion. Al nuts shall be galvanized with the exception of the threads, which shall be oiled.

7.1.11 Insulators and Fittings

7.1.11.1 Insulators

Insulation between conductors and support shall be of both disc, pin and post insulators and shall comply in all respects with IEC 305, 383 and 120, 1109 and 815 or such other standard as may be approved and with the requirements set out in this Specification and in the Technical Schedules.

Insulators composite polymeric type from approved manufacturers who shall have hadat least ten years' experience of supplying complete insulator units to international purchasers. Technical particulars and service histories must be submitted for the typeof insulator offered. Insulator units shall where possible be interchangeable with units already in use on the Employer's system.

All insulators shall be designed with a view to service in a tropical climate in an areasubject to lighting storms, at an altitude of about 2200 m above sea level.

Insulator strings shall consist of minimum quantity of 6 units for 66kV, 3 units for 33kV and 2 units for 11kV at 146 mm centre distance between each disc. The actual numbers and types of discs shall be selected to suit the requirements set out in the technical schedules.

Locking devices for the insulator units themselves and for associated ball and socket and fittings shall be of stainless steel and shall comply with IEC 372. The assembly shall be such as to allow easy removal for replacing of insulator units or fittings without the necessity to remove the insulator string from the crossarms.

All ball and socket joints on insulator sets shall be lightly coated with approved greasebefore erecting.

Each insulator shall be marked with the name or trade mark of the manufacturer and the year of manufacture in accordance with IEC Publication 60383. In addition, each insulator shall be marked with the specified electromechanical or mechanical failing load in conformity with IEC Publication 60383.

7.1.11.2 Insulator Fittings

Fittings shall comply with BS.3288: Part 1 or such other standard as may be approvedand shall be so designed that replacement of string insulator units and the arcing protection system can easily be performed during maintenance or repair under outageor live-line conditions.

All clamps shall be as light as possible and shall be designed to avoid any possibility of deforming the stranded conductors and separating the individual strands.

Bolts and nuts shall be in accordance with an approved specification. Bolt threads shall be coated with approved grease immediately before packing. Split pins for securing attachment of fittings of insulator sets shall be of stainless steel and shall bepacked by washers of approved size and gauge.

All insulator strings shall be attached to crossarms by means of shackles or

swivels. Hooks shall not be used.

7.1.11.3 Pin Insulators

Pin insulator shall be used for intermediate line poles and for small angles up to 20°.

On pin insulators, the conductor shall be bound in on top of the groove, using two suitable stirrups in each case. The bind shall be formed of a single layer of closely wound wire, extending at least 25 mm beyond the stirrups. The bind shall be wound on opposite directions, on each side of the insulator.

With aluminium conductor, the bind shall be formed of two stirrups, with 2.5mm diameter aluminium binding wire. In addition, aluminium amour tape shall be used, wrapped in a direction opposite to that of the conductor lay. The amour tape shall cover the portion of the conductor that is in contact with the insulator, and extend at least 40 mm under the bind.

7.1.11.4 Composite Polymeric Insulators

Composite polymeric Insulators will be used where increased tensile strength in the conductors is envisaged i.e. flying angles, section and terminal poles.

The table below gives creepage distance requirement in relation to pollution

Type of pollution	Creepage distance
Low	18-22 mm/kV
Medium	22-35 mm/kV
Extreme (Coastal/industrial area)	> 35 mm/kV

Where there is severe lighting activity, high insulation and creepage values are necessary.

7.1.11.5 Post Insulators

In high pollution areas (Cost region) 33kv line shall use Post insulators for 66 kV lineand 11kv lines shall use 33kv line post insulators.

All insulators to be used shall be composite polymeric insulator unless stated in the general technical specifications.

7.1.12 Cross Arms

The following types of cross-arms shall be used depending on the limiting factor

7.1.12.1 Steel Cross Arms

Steel crossarms shall be used in all cases as required.

Steel Crossarms shall be used extensively in the line making different formations. Thechoice of the formation will be determined based on the following:

i) Environmental conditions
ii) Landscape
iii) Available space

The steel crossarm shall be suitable for continuous operation outdoors in tropical areasat altitudes of up to 2200m above sea level, humidities of up to 90%, average ambienttemperature of +30°C with a minimum of -1°C and a maximum of +40°C and saline conditions along the coast.

7.1.12.2 Materials

Structural steel used, shall be grade 43A as specified in the BS 4360: "Specification for weld able structural steel".

The tensile strength and yield stress of the steel shall be not less than 430/510 N/sq. mm and 255 N/sq. mm respectively.

Angle sections shall be as per
BS 4848Channel sections shall
be as per BS4

7.1.12.3 Welding

Welding where specified shall be by metal-arc welding and shall be as per BS 5135. After welding and before galvanising, welds shall be thoroughly cleared to removeslag and spatter, preferably by sand blasting.

All materials before and after fabrication shall be straight and free from twists. The material shall be free from blisters, scale and other defects.
All dimensions specified shall be subject to the following tolerances, unless otherwisestated.

(i) Dimensions up to and including 50 mm: ±1 mm
(ii) Dimensions greater than 50 mm: ±2 mm

Erection clearance for cleated ends of members connecting steel to steel shall not be greater than 2mm at each end.

Bolt holes shall not be more than 2mm greater than the diameter of the bolt for bolts up to 24mm diameter.

Cutting may be by shearing, cropping, sawing or machine flare cutting. Sheared or cropped edge shall be dressed to a neat finish and be free from distortion where partsare to be in metal contact.

All holes shall be drilled in one operation and burrs shall be removed. Holes shall notbe formed by a gas cutting process. All matching holes for bolts shall register with each other so that a gauge 2mm less in diameter than the diameter of the bolt shall pass freely through the assembled members in a direction at right angle to such members.

7.1.12.4 Galvanizing

All materials to be galvanized shall be of the full dimensions shown or specified and all punching, cutting, and the removal of burrs shall be completed before the galvanizing process commences.

All galvanizing shall be done by the hot dip process with spelter, not less than 98% ofwhich must be pure Zinc and in accordance with BS 729.

The Zinc coating shall be uniform, clean, smooth and as free from spangle as possible.

Galvanized steel structures shall be treated after galvanizing with Sodium DichromateSolution.

Galvanizing	Steel Structures for Inland installations
Minimum Average Coating Weight	610 g/m²

Bending of flat straps shall be carried out cold.

7.1.12.5 Standard Sizes

The standard sizes of the different cross arms shall be as shown on the table below:-

Application	**Standard Length (mm)**	**Cross Section**		
		Height (mm)	Width (mm)	Thickness
11kV inter pole. Up to 150mm^2 conductor.	1626	70	70	9.5
11kV Section/Angle/Terminalia up to 60° 150mm^2 conductor.	2290	125	70	9.5
33kV Inter pole	2400	100	76	9.5
33kV Section/Angle pole/ Terminal	2400	125	76	9.5

7.1.12.6 Markings

The cross arms shall be marked legibly and indelibly on an aluminium tag size not lessthan 400mm x 200mm fixed at a distance of between 150mm and 350mm from the end. The thickness of the aluminium shall not be less than 0.9mm (SWG 20).

The tag shall be stamped with the following information:-

i) Identification mark or name of the plant where cross arm was treated.
ii) Date of treatment, comprising the first two digits for the month and the last twodigits for the year.

The letters and figures shall be at least 10mm high.

7.1.13 Line Formation

The following is a recommendation for the use of the different common lineformations:

i) Line poles for deviations 0°-10°, Steel cross arm will be used for horizontaland delta formations.
ii) Line poles for deviation 20o-60o, double cross-arms or vertical flying angleshall be used.

iii) Line poles for deviations greater than 60o, vertical sections shall be used.

7.1.14 Stay, Stay Insulators and Stay Blocks

7.1.14 .1 Stay

Stay wires shall be in conformity with the attached Specification for Stay Wires andGuy Grips.

The dimension of stay wires used shall be in accordance with the actual load takinginto consideration the Safety Factor given.

The stay wires shall with first-class workmanship be fastened to the pole to assure thatthey are keeping the pole in a vertical position during the pole's lifetime.

7.1.14.2 Stay Insulator

A sling type strain insulator shall be inserted in each stay 1.6m from the top.

7.1.14.3 Stay Block

A reinforced concrete stay block buried to the depth of 1.4m shall be used as the stayanchor.

7.1.15 Conductor

Phase conductor to be used shall be Aluminium Conductor Steel Reinforced (ACSR)or All Aluminium Alloy Conductors (AAAC) and shall consist of steel strands together with aluminium strands or aluminium strands only.

The outermost layers of the conductors shall be stranded with right hand lay. There shall be no joints in the individual wires of the outer layers of the aluminium wire.
The requirements for the conductors are specified in the attached Specification for Aluminium Alloy Conductors and Specification for Aluminium Conductor Steel Reinforced.

7.1.15.1 Conductor Characteristics

The conductors shall conform to the following:

16a Physical characteristics

Nominal Al. area (mm^2)	Code Name	Steel No./mm^2	Alum. No/mm^2	Over all dia. (mm)	Calculated Al. equ. Area (mm^2)	Total cond. Area (mm^2)	Weight Kg/Km	Copper Equiv. Area (sq.in)
150	Wolf	7/2.59	30/2.59	18.1	154.3	195.0	727	0.15
300AAA	Upas		37/3.53	24.71		362.1	997	0.3

16b Electrical characteristics

Nominal Al. area (mm^2)	Tensile Strength kgs		Resistance at 20 °C Ohm/Km	Current Rating Amp	Inductive reactance ohm/Km Spacing	
					30cm	50cm
150	6880		0.1844	430	0.235	0.266
300	10600		0.09155	610		

The current ratings are based on the following operating conditions:Ambient temperature: 35°C
Maximum conductor temperature:
80°C Intensity of solar radiation:
0.089 w/cm2

7.1.15.2 Joints, Clamps and Connectors

Conductor fittings shall be designed in accordance with BS.3288. The electrical conductivity and current capacity of each joint or clamp shall be not less than those ofthe equivalent length of conductor.

Dead end clamps and tension joints shall be of the wedge clamp type and shall be so as not to permit slipping of or cause damage to or failure of the complete conductor ata load less than 85 per cent of the ultimate strength of the conductor. (Refer to the safety factors: 3.0 for conductors, 2.5 for clamps/fittings))

The design of joints and any tools to be used in their assembly shall be such as to reduce to a minimum the possibility of faulty assembly. All external nuts shall be locked in an approved manner. There shall be no relative movement within the clampbetween individual layers of the conductor itself.
Mid span joints shall comply with the mechanical requirements of the Specification for line conductor joints and clamps. Compression dies shall be of a common size anddimensions for each fitting for a given size of conductor. Not more than one mid span joint will be allowed in one span in one conductor.
Parallel Groove (PG) clamp can be applied to joint conductors where there is no mechanical load.

7.1.15.2.1 Conductor Terminations.

Ball ended hook, Socket clevis and Socket tongue shall be suitable for use on Aluminium conductor steel-reinforced (ACSR) of outer diameter between 7.00 mm and 18.2 mm (25 sq. mm and 150 sq. mm) and standard disc insulator of ball and socket type with the ball pin diameter of 16 mm.

Ball ended hook, socket clevis and socket tongue shall be of malleable iron or ductile iron, hot dip galvanised to BS 729.

Tension clamp shall be bolted type and shall be suitable for use on aluminium conductor steel-reinforced (ACRS) of outer diameter between 7.00 mm and 18.2 mm(25 sq. mm and 150 sq. mm).

The clamp body and keeper piece shall be of high strength and heat-treated cast aluminium alloy.

The clamp cotter bolts, and U-bolts shall be galvanised steel and the pin shall be stainless steel.

The clamp shall have slip strength of not less than 85% of the rated ultimate strength of conductor it is intended for use with.

7.1.15.2.2 Joints (Non-tension)

Parallel groove clamp (PG Clamp) shall be suitable for use on aluminium conductor steel-reinforced and all aluminium conductors of outer diameter in the range of 7.00 mm to 18.2 mm for ACSR conductors and 9.0 mm to 13.2 mm for AAC conductors (25 sq. mm and 150 sq. mm).

(a) The groove of the PG clamp shall correctly fit the conductor it is intendedfor use with. It shall have adequate cross-sectional area and length.

(b) The PG clamp shall be of electrolytic, high strength, corrosion resistant aluminium alloy.

7.1.15.2.3 Suspension Clamps

Suspension clamps shall be suitable for use on aluminium conductor steel-reinforced (ACSR) of up to 18.2 mm diameter (150 sq. mm) and shall be of the following types.

(a) Clevis ended hook type and pivoted type (similarly known as envelope type and trunnion type respectively).

(i) The clamp body and keeper piece shall be of high strength, heat-treatedcast aluminium alloy.
(ii) The clamp cotter bolts, hangers, brackets and U-bolts shall be of galvanised steel and the cotter pin shall be of stainless steel.

(b) Angle suspension clamp type (similarly known as side opening type).

(i) The clamp shall be suitable for use on turning angles from 10 to 120degrees.
(ii) The clamp body and keeper shall be of malleable iron or ductile iron,hot dip galvanised to BS 729.
(iii)The clamp cotter bolts and bolt shall be galvanised steel and the cotterpin shall

be stainless steel.

7.1.15.2.1 Connectors

The connectors shall be suitable for use on stranded bare conductors and shall correctly fit the conductor it is intended for use.

The connector shall have adequate cross sectional area and dimensions and shall have current carrying capacity at least equal to the capacity of the conductor it is intended for.

(a) Aluminium connectors

(iv) Aluminium connectors (line taps) shall be suitable for connectingstranded aluminium conductors

(v) The connector shall be manufactured from electrolytic, high strength aluminium.

(b) Copper connectors

Copper connectors shall be suitable for connecting stranded copper conductors.

(c) Bi-metal connectors

(vi) Bi-metal connectors shall be suitable for connecting stranded aluminium conductors to stranded copper conductors.

(vii) The bi-metal connector shall be designed to provide an effective corrosion barrier between the dissimilar metals (aluminium and copper).

7.1.15.3 Drums

Drums for conductors shall be stoutly constructed of good quality timber or steel andclearly marked with length and type of conductor in a manner not easily removable. Drums shall be securely battened around the perimeter and shall be lined withapproved impervious material to prevent contact between the contents and both the drum itself and any chemicals with which the drum has been treated.

All timber drums and battens shall be protected from deterioration on site by termite or fungus attack by an approved impregnation treatment at the works before dispatch.Such substance shall not be harmful to the conductor.

All drums shall have spindle holes of adequate diameter and be stoutly reinforced withsteel plate.

The cut ends of the conductor shall be properly secured to the flange of the drum andshall be treated in an approved manner to prevent the ingress of moisture during transitor storage.

The Contractor shall deliver all empty drums to the employer's store. All drums are non-returnable and shall remain the property of the Employer.

7.1.15.4 Markings of Drums

The following particulars will be indelibly stencilled on both flanges of every drum:

(ii) Contract title and reference number
(iii) Manufacturer's name
(iv) Direction of rolling
(v) Lifting instructions and limitations

An aluminium nameplate shall be fixed to each drum clearly showing the following:-

(A) Conductor materials and stranding
(B) Length of conductor
(C) Net weight
(D) Gross weight
(E) Manufacturers batch number
(F) Manufacturers drum number
(G) Winding date
(H) Approximate measurements

7.1.15.5 Conductor Stringing

All stringing equipment shall be properly anchored and shall be positioned in such away that structures, insulators and fittings will not be overloaded.

Every precaution is to be taken to prevent damage to the conductor. Clamps and otherdevices used for handling the conductor during stringing shall allow no slippage or relative movement of strands or layers and shall not pinch or deform the conductor. Conductor grooves in sheaves and tensioner shall be lined with neoprene or rubber.

Conductors shall be effectively earthed in an approved manner during running out andat all places where men are working on them.

Conductor drums shall be closely examined before conductor pulling commences andall nails and other things that could damage the conductor shall be removed.

7.1.15.6 Re-conductoring

Where applicable before the re-conductoring commence, the Contractor shall inspectthe line and check that the clearances to ground, trees, houses, roads etc. meet the requirements. He shall also check that:

- The capacity of poles, cross arms and stay wires is sufficient for the new conductor
- The quality of poles, cross arms and stay wires is satisfactory
- The pole heights are sufficient for the new conductor
- The poles are in vertical position

Where the existing installation not meet the above requirements, change out of material or aligning work of poles have to be carried out.

When re-conductoring, the Contractor has to handle all tilted poles with outmost care.Before loosen the existing conductors, the poles have to be secured with stay wires. Climbing the poles has to be done by use of ladders placed against the tilted direction.

All tilted poles have to be corrected to a vertical position before the stringing work of the new conductors starts. Poles that do not meet capacity- or quality-wise meet the new requirements have to be changed out.

After aligning the poles, the top of the pole shall not be out of the vertical axis by morethan the top pole diameter.

All clamps, fittings and details not suiting the new conductors or quality-wise not meetthe requirements, shall be changed out.

7.1.16 Safety

Personnel shall be required to use necessary protective gear, which conform toapplicable codes.
Personnel working near high voltage areas shall be required to use non-slip foot wear,gloves, safety glasses, helmets, etc. They shall also be required to observe stipulatedsafety clearances.

Fire prevention and safety programmes shall also be observed.

7.1.17 Operation Devices and Protection Systems

Operation devices consisting of single and three pole disconnectors shall be installed at locations specified by the designer. The disconnectors shall be easily accessible during normal conditions. They will be fixed in such a way that they cannot be closedby the action of gravity. Their characteristics shall be capable of meeting the maximum rated current of the circuit.

7.1.17.1 Isolation

7.1.17.1.2 Air break Switches

Air break switches shall be used to interrupt small currents (up to 10% of rating of ABS).

7.1.17.1.3 Protection against over Voltages

Protection against overvoltage will consist of surge diverters at locations specified bythe designer. For a solid tee-off of 33 and 11kV lines an Air Break switch shall be install for Isolation and fast actin g expulsion fuses for protection.

7.1.17.1.4 Protection against Overcurrent

The network comprises main line and spurs.
Circuit breakers shall be installed at the beginning of the main line at the primarysubstation. Short circuit fuses shall be installed at the beginning of the primary spur. Autoreclosers and Sectionaliser shall be located as specified by the designer.

7.1.18 Factory Acceptance Test

The Employer shall witness the tests of main equipment at the factory before their shipment. The Employer shall be in charge of the air travel, accommodation and per diem costs of its personnel. Contractor shall cater for FAT costs within the factory andlocal transport for the employer team. The following major equipment if required foruse in the projects shall be

offered for inspection:

- 150mm^2 ACSR conductor
- 75mm^2 ACSR conductor
- All Single/three core Cu cable
- All Single/three core Al cable
- OPGW and Underground FOC
- Insulators (11kv and 33kv)

FAT shall be carried out as prescribed in the particular technical specification.

PARTICULAR TECHNICAL SPECIFICATIONSFOR SWITCHGEARS AND AUXILIARY SUPPLY

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8 Particular technical specifications for Switchgear

8.1 General

These Particular Technical Specifications covers the particular technical requirements of the equipment to be procured under this contract.

In order to give the necessary background, equipment not needed in this specific tender may be included. The Scope of Work will in such cases give the limitations in the supply.

The Plant and Equipment is detailed in the section Scope of Works. Where a Turn Key Delivery is requested this shall cover engineering, design, manufacture, testing before shipment and packing seaworthy or otherwise as required, delivery CIP site, unloading, storage, civil works, erection and commissioning.

The Turn Key Stations shall furthermore cover a complete supply for substation including apparatus supports, cable racks and conduits with associated fixing material, insulators, conductors and clampsfor bus bars and apparatus connections, Earthing systems, all cabling and connections, control an protection panels as well as any other equipment and materials not specifically mentioned or quantified, but which are required to make a complete and proper functioning substation.

8.2 Design Data

Provided no special data are given below, the equipment shall be designed in accordance with the requirements given in "Project Specific Data"

The tentative single-line diagrams, layout plans and sections for the various projects are shown on the drawings enclosed to the Tender Documents. The drawings will be submitted with the bidding documents.

8.3 General Clauses for HV and MV Switchgear

8.3.1 Breakers and Switches

Breakers and switches equipped with motor drive shall be provided for electrical local and remote control. The control voltage for closing and opening commands and for the energy storage of circuitbreakers is 110V DC from station battery. The motor drive for switches and Breakers shall be controlled with 110VDC or shall be universal motors (110VDC/Single phase -230VAc.

The complete operating mechanism, including the controls, shall be built-in watertight and dust-proofcubicles fulfilling the requirements for outdoor enclosures as stated in the General Specifications. Allparts shall be easily accessible without dismantling other parts. Direct, local push buttons for operating the breaker shall be located not more than 1.7 m above ground. All wiring shall lead to terminals. 10% of the terminals shall be spare.

A local/remote control selector switch shall be provided in the cubicle. With the selector switch set to local control, operation from any remote source apart from the protective relays shall be inhibited.The switch shall have contacts for remote indication.

A sufficient number of auxiliary contacts, with at least 10NO and 10NC contacts as spare, for 110 VDC shall be provided for control and interlock purposes.

Motors shall be designed in accordance with valid IEC publication and shall be effectively protectedby miniature circuit breakers, with alarm contacts.

8.3.2 Circuit Breakers

All circuit breakers rated 33KV and below shall be Vacuum type, whereas those rated 66Kv and above shall be SF_6 gas type

All circuit breakers shall be provided with means to prevent contact pumping while the closing circuitremains energized should the circuit breaker either fail to latch or be tripped during closing due to the operation of the protective relays.

The opening device of a circuit breaker shall be provided with two independent trip coils, connectedto separate terminal blocks in the terminal cubicle, allowing for the connection of two independent opening command circuits.

A local position indicator, visible with the panel door closed, shall be mounted in the front panel of the operating mechanism cubicle.

A crank, lever or other similar suitable device shall be provided to permit charging the operation mechanism by hand in the event of a failure of the auxiliary supplies or in the event of a failure of the energy-storing device.

It shall be possible to determine the available operating energy stored by the mechanism prior to operating the circuit breaker. An alarm shall be given in the event of the stored energy falling belowa minimum rated level.

If the stored operating energy is below a minimum rated level in one or more of the mechanisms, closing and auto- reclosing shall be blocked in all phases.

8.4 Measuring Transformers

If output of measuring transformers are not given the Contractor shall calculate the necessary outputbased on the instruments and cable length he needs. The output of the measuring transformers for measuring and protection purposes shall be determined according to the technical requirements, but shall not be less than 125% of the overall computed (design) burden of the connected apparatus and conductors. However, the transformer shall not be loaded less than 60 % of rated burden.

- Power frequency test voltage on secondary windings, 1 min. 2.5 kV
- Overvoltage inter-turn test, 1 min. 3.5 kV

8.4.1 Current transformers

The current transformers shall be designed to carry continuously a current of 120% of the primary rated current.

The rated current of the secondary windings shall be 1Ampere, unless otherwise specified in Scope of Works, the different cores shall have the following characteristics.

The core(s) for measuring:

- ☐ Accuracy (if not otherwise specified in scope of work) class 0.2
- ☐ Instrument security factor equal to or less than 5

The core(s) for energy metering:

- ☐ Accuracy (if not otherwise specified in scope of work) class 0.2
- ☐ Instrument security factor equal to or less than 5

The core(s) for protection:

- Accuracy for overcurrent and earth fault class 5P20
- Transformer Differential protection class X or SP
- Line differential protection class X or SP
- Distance protection class X or SP
- Restricted earth fault class X or SP

☐ Accuracy limit factor equal to or greater than 20

Neutral Current transformer
Shall have at least three cores: Earth fault class 5P20 (two cores)
Restricted earth fault class X or SP

☐ Accuracy limit factor equal to or greater than 20
☐ The Neutral current transformer shall have the same current ratio as Phase currenttransformers

The core(s) for bus bar protection:

☐ To be adapted to the protection scheme offered, but most preferably shall beclass 5P20
☐ The Line current transformers shall have at least four (4) cores, whereas for the neutralshall have least Three (3)cores

The core characteristic shall be optimized to the selected scheme in sections where new bus barprotection shall be installed.

The characteristics of the current transformers shall comply with the provisions stipulated in IEC60044.

The Contractor shall demonstrate that the current transformers selected will ensure correctfunctioning of the associated protective equipment.

8.4.2 Voltage Transformers

The windings for measuring purposes shall be designed as follows:
The core(s) for measuring:

☐ Accuracy (if not otherwise specified in scope of work) class 0.2

The core(s) for energy metering:

☐ Accuracy (if not otherwise specified in scope of work) class 0.2

The core(s) for protection:

☐ Accuracy class 3P
☐ The Voltage transformer shall have two cores

The secondaries shall be provided with a single poles 2 or 4Ampere miniature circuit breakers withalarm contacts.

The characteristics of the voltage transformers shall comply with the provisions stipulated in IEC 60186 (and IEC 60358 for capacitive voltage transformers).
The Contractor shall demonstrate that the voltage transformers selected will ensure correct functioning of the associated protective equipment. The contractor shall also describe the actions taken to avoid Ferro-resonance in the circuit.

8.5 SF_6 gas

8.5.1 Low Density Warning

For all components using SF_6 gas as isolation media a system for visual continuously monitoring of the gas density shall be provided. At a certain low density a signal shall be given to indicate that refilling should take place. At the extreme low density circuit breakers should be automatically blocked against operation.

8.5.2 Gas Refilling

SF_6 gas refilling equipment mounted on a trolley shall be provided for each substation. The gas handling apparatus to be supplied couplings for all apparatus in the station and shall have sufficient storage facilities for the maximum quantity of gas that could be removed when carrying out maintenance or repair work on the largest section of the switchgear.

8.6 High and Medium Voltage Outdoor Switchgear

8.6.1 General

The substation design should be such as to minimize the number of levels of conductors and to ensurethat the consequences of a failure of one set of high-level conductors are limited to the loss of that circuit and a single bus bar section. This principle shall also be applied with regard to earth wire conductors.

All apparatus shall be erected on galvanized steel supports dimensioned for the weight of the apparatusas well as short-circuit forces, the climatic forces and the forces arising under operation. Steel latticelanding gantries shall be arranged for incoming lines design for the last slack span.

Vehicle access to permit the transport of major switchgear equipment shall be provided. This shall beachieved without the need to de-energize circuits.

All breakers and switches shall come ready for distribution automation.

This Section covers the technical requirements of the high voltage equipment to be installed at the outdoor switchyards.

8.6.2 Circuit Breakers

The three-phase circuit breakers shall be of the outdoor, single pressure SF_6 for 66Kv and above andVacuum type for 33Kv and below. The breakers shall be mounted on steel structures.

For 132 kV Voltages and above three-phase rapid auto-reclosing only is required and the mechanismshall be common for all poles (ganged type) for transformer bay and Bus bar, and single poles for Lines.

A spring-operated mechanism is be employed. Pneumatic and Hydraulic operating mechanism are not accepted.

The breakers shall be capable of handling the following operation cycle, according to the IEC recommendations:

0-t-CO-t'-CO t = 0.3 sec t' = 3 min and CO-t2-CO t2=15 sec

The total breaking time (opening time plus duration of the arc) of the breakers shall be as short as possible, but in no case is it to be longer than 50msec. whereas closing shall be less than 70msec.

The stored energy shall for all types of operating mechanisms be sufficient to allow a complete O-C-O cycle.

8.6.3 Disconnectors and Earthing Switches

Disconnectors and earthing switches shall be manufactured in accordance with IEC 60129. All shallbe mounted on steel structures.

All disconnectors and earth witches shall be operated both electrically and manually.

The contact surfaces shall be heavily silver-plated. The contact pressure shall be ensured by means of springs.

Each three-phase isolating switch and each three-phase earthing switch shall be equipped with its own independent operating mechanism.

In the case of a complete failure of the electrical operating mechanism all switches shall be operablemanually by means of a lever or crank or another feature. The manual mechanism shall allow safe switching under energized but no load conditions and shall be operated from a standing position.

The disconnectors and earth switch shall have enough auxiliary contacts for signaling, commands and interlocking plus spares for automation use. Insertion of the operation handle (mechanical operation) shall automatically disable electrical operation.

The control circuit and the driving mechanism motor shall be 110Vdc operated.

Disconnectors shall have mechanical interlocking to the attached Earth switch. The interlocking shallprevent closing of earth switch when the disconnector is in closed position, and disconnect the motorand prevent closing of the disconnector when the earth switch is closed.

8.6.4 Measuring Transformers

The measuring transformers shall be single-phase, oil-immersed, mounted in one insulator. They shall be mounted on steel structures. Each transformer shall be equipped with an oil level gauge to be easily visible from the ground. The transformers shall be supplied including oil filling. The oil ofthe measuring transformer shall be hermetically sealed against the ambient air. The sealing method shall be described in the Tender, as well as the method of compensation for changes in the oil volumedue to temperature changes. Gas cushion shall not be used. The Bidder shall indicate the measures provided for relieving dangerous pressure rises that may develop due to an internal electrical fault.

The primary connections of all measuring transformers shall be silver-plated. All secondary connections shall be connected to a terminal block, which shall be located in a dust-proof and watertight terminal box and shall be clearly labelled. An earth connection to the housing shall be provided for sensitive earth fault protection, torroidal CT shall be installed in all feeders.

8.6.5 Lightning Arresters

The lightning arresters shall be of the metal oxide gapless type, complying with IEC 60099-1 For tendering purposes the lightning arresters shall have the following characteristics (the Contractorshall check the values by calculations to be approved by the Project Manager):

System Voltage	132kV	66kV	33kv	11kV
(1) Continuous operating voltage (r.m.s.) (kV)	84	42	22	7
(2) Rated discharge current (8/20 ms) (kA)	10	10	10	10
(3) Rated Voltage (kV)	108	54	27	9
(4) Creepage distance (mm)	4092	1800	900	500

As all other main parts of the switchyard they shall be mounted on steel structures.

The lightning arresters shall be fitted with a pressure relief device, Current indicating meter (optional)Operating counter. Surge counters shall be supplied for each single-phase arrester for 11Kv voltagesand above

The earth conductor from the arrester to the counter as well as the in-terminal of the counter shall besuitably insulated or screen protected against accidental touching.

8.6.6 Line Traps

Where line traps are required, they shall comply with IEC 60353. They shall be suitable for mountingdirectly on the associated coupling capacitors, or separately on post insulators.

The traps shall be secured against birds nesting. The line traps shall have the following characteristics:

1) Minimum Inductance 0.2mH
2) Min. resistive impedance > 570Ohm
3) Minimum rated current 1250 A
4) Short time current 31.5kA

The main coil with its spark gap shall have a self-resonant frequency higher than 500 kHz.

The Bidder shall furnish with the Bid a diagram showing the resistive impedance of the traps as a function of the frequency.

The line traps shall be of the band tuned type. Tuning device and surge arrester according to IEC 60353 shall be installed. The tuning device shall be adjustable in the range 260–502 kHz. Each line trap shall be enclosed by bird barriers

Every line trap shall be supplied with a line matching unit as per specifications in paragraph 8.6.8 below.

8.6.7 Coupling Capacitors

Where capacitor are required, they shall have a rated capacitance of not less than 2000pF and shall meet the insulation level and test voltage equivalents of IEC recommendation for each device (IEC 60358 Coupling capacitors and capacitor dividers)

8.6.8 Line Matching Units

Where they are required, the Phase to phase coupling units complete with coupling filters and protection circuit, including hybrid transformer.

The high frequency coupling units shall be assembled in a sheet steel box or similar and be suitable for mounting on the pedestal support for the coupling capacitor. The filters are to be suitable for outdoor use in a hot dusty/humid climate and are to have weather proof door seals together with breather holes to avoid condensation. The units are to have an earthing switch which should preferably be interlocked with the box door/lid such that the latter cannot be opened unless the earthswitch is closed to earth the device, and clear ON/OFF position of this switch should be indicated. The terminal of the filter, which shall be connected directly to the substation earth, shall be clearly designated. The device shall meet requirements of IEC 60481.

The device shall be fitted with a rating plate clearly defining but not limited to the following data:

- Manufacturer's Name
- Type
- Serial number
- Peak envelope power
- Available bandwidth or working range

Technical requirements:
Bypass filter:

- Impedance, equip. side unbalanced 75/125 Ohm
- Impedance, line side 240/320 Ohm
- Nominal PEP at < 50kHz < 400 W
- Nominal PEP at > 100kHz < 1000 W
- Coupling capacitance 1.5 to 20nF

Drain Coil:

- Inductance, adjustable 0.2 – 0.7 mH
- Impedance at power frequency < 1.5 Ohm

Earthing Switch:

- Rated current 300A r.m.s
- Lightning Arrester:
- Rated voltage 660 V
- Max. 100% impulse spark over voltage 3300 V
- Rated discharge current 5kA

8.7 Conductors, Insulators, Accessories

8.7.1 Conductors

Unless otherwise stated in Scope of Works, the conductors shall be concentrically laid, stranded,flexible conductors made of round aluminium, aluminium alloy or copper wires. The alloy shall bealuminium alloy 6201-T81 in accordance with ASTM Standard B 398-67 (equivalent IEC standard)or aluminium alloys of similar approved composition, as known under the trade name "ALDREY". The same type of conductor may be used for the overhead earth wires, the cross-sections being atleast the equivalent of 95mm^2 copper. Other earth wires shall always be of copper.

The cross-sectional area of the conductors shall be chosen according to the electrical and mechanicalrequirements, and shall be proposed in the Tender. Rated currents are given in Scope of Works, for each substation. The minimum factor of safety for bus bars or other connections based on elastic limitshall be 2.5.

The number of different cross-sectional areas to be used for the current carrying conductors shall bestrictly limited. For overhead earth wires the same cross-sectional area shall be used for all substations.

All wires making up the conductor shall be free from dirt, splints, scratches and all imperfections notconsistent with the best commercial practice.

The conductor shall be tightly and uniformly stranded with no loose strands and when subjected to 50% of ultimate strength, it shall show no high wires but shall maintain a true cylindrical form. AnyCu-Al connections shall be made with special junction pieces, outdoor as well as indoor.

Supply and erection of conductors and earth wires from dead end towers to gantries will be providedfor under other contracts. It is however, the Contractor's responsibility to supply and erect the clampsand connections to the intake.

8.7.2 Tubular Conductors

If tubular bus bars are used they shall be made of aluminium-magnesium-silicon tubes in accordancewith IEC 60114. They shall be designed to withstand thermal and dynamic stresses under normal duty and maximal short-circuit current without damage. Fastening shall be so that thermal expansionis accommodated without any undue stresses.

Transformer bays (HV and LV) for 7.5MAV 33/11kV substation and above shall use aluminium- magnesium-silicon tubular Bus bars or 2 x 300mm^2 AAA conductor.

8.7.3 Insulators

The post and string insulators shall be of the silicon rubber type. The post insulators shall be dimensioned in accordance with IEC 60273. They shall comprise fully interchangeable units of eitherthe pedestal or solid core cylindrical type and shall be designed so that they can be used either uprightor inverted.
Substation insulators shall be porcelain type whereas Line insulators shall be polymeric type.

The string insulator units shall comply with the provisions of IEC 60120, IEC 60305 and IEC 60372.The type of insulator and the characteristics of the discs and the number of discs per string shall be chosen according to the electrical and mechanical requirements, and shall be proposed in the Tender.

Minimum factors of safety shall be:

- ☐ For complete insulators based on electro-mechanical failing load test (IEC 60383) 2.5
- ☐ For insulator metal fittings based on elastic limit 2.5

Each insulator shall be marked with the initials or trademark of the manufacturer and with theguaranteed electromechanical strength. All markings shall be plainly legible and durable.

8.7.4 **Accessories**

For all accessories as clamps, connections, etc., care shall be taken to fulfil all conditions required concerning current carrying capacity, mechanical strength, glow discharge characteristics, corrosionresistivity and easy mounting, etc.

All accessories shall comply with VDE Standard 0210 and 0212 and with the corresponding DIN specifications or with other similar and approved specifications and shall be tested according to the same specifications.

8.7.5 **Cable Ducts**

All necessary cable ducts from the switchyard to the control building to be included in the tender. The cable ducts are specified in Section - Civil Works.

8.7.6 **Cable Marshalling Kiosks**

For each switch bay a separate dust and waterproof, cable marshalling kiosk shall be provided, witha minimum IP 54. It shall be possible to securely fix the hinged front door in open position.

All secondary cables coming from the circuit breakers, disconnecting switches, instrument transformers, etc., shall be collected in this cable marshalling kiosk. From here, a minimum amountof multicore or fibre optic cables shall lead to the control room.

The cable marshalling kiosks shall be equipped with rows of terminals for all potential and current circuits, including the necessary test terminals with bushings and lashes.

At least 10% of the terminals shall be spare. For the switch bays, which are not entirely equipped with switchgear, the kiosks shall have all necessary terminals plus 10% spare as if the switch bays were complete.

The kiosks shall be ventilated by means of suitable openings, covered with dust filters and have drainage plugs at its lowest location.

Each kiosk shall be equipped with a thermostat controlled heater in order to avoid any moisture. Theheaters shall be so located that it does not damage any equipment or cables when let on.

An internal AC, single-phase socket outlet for hand lamps and small tools, and an AC three phase socket outlet for heavy tools shall be provided in each and every cable marshalling kiosk. All these outlets to be according to the same standards as for the control building.

Miniature circuit breakers, with alarm contact, shall be provided for the voltage transformer secondaries.

All terminals, socket outlets and other parts of the kiosks shall be easily accessible without dismantling any part.

8.7.7 Tests

Tests shall be made in accordance with the applicable standards. Type test shall be carried out on onesample of the equipment or as requested by the employer.

8.7.8 Conductors, Insulators and Accessories

Tests for physical and electrical properties on conductors shall be made in accordance with ASTM Standard B 398 and 399 (IEC Equivalent) or other equivalent and approved standard. These tests onwires shall be made on wires removed from the complete conductor. All wires making up the conductor sample shall be tested.

Sampling, inspection, tests and acceptance of the insulators shall be in accordance with ASA Standards C 29.1 (IEC Equivalent), Test Methods of Electrical Power Insulators and C 29.2, Wet Process Porcelain Insulators (Suspension Type).

8.9.9 Tests on the Switchyard on Site

All electrical equipment and installations shall be tested for correct connections of the high-voltage circuits as well as of the control and measuring circuits, installation, insulation, and earthing.

All electrical equipment and installations shall be subjected to a complete operational test to check the correct operation thereof in terms of the operational requirements specified in these Specifications.

8.10 Autoreclosers

8.10.1 General

Auto-reclosers are used on less important 33/11kV lines outside the substations on lines instead ofcircuit breakers.
The Autoreclosers are not acceptable for line bay use inside the substation. The Auto-reclosers shallbe designed for pole mounting with the following features:

(I) Ability to distinguish between permanent and transient/temporary faults
(ii) Ability to interrupt fault currents and thereafter restore every supply.
(iii) Ability to switch normal load currents.
(iv) Ability to coordinate with other protective devices such as drop out fuses, Sectionaliser and circuit breakers controlled by normal IDMT protection curves.

Autoreclosers shall be equipped to provide three phase tripping and Reclosers, then lockoutafter a pre-selected sequence of three phase unsuccessful Reclosers.

If a recloser is successful the operating mechanism shall re-set to make available the fullsequence of operations.

A minimum availability of four opening operations shall be provided with an autoreclose facility on the first three, the fourth opening shall cause lockout. Once the recloser is lockedout manual resetting is required in order to restore service.

It shall be possible by a programmable setting device to select the number of operations which the recloser will perform automatically and also the time delay which may be applied to each individual operation independent of the other operations (this also means to block the recloser function when used as transformer breaker)

8.10.2 Modes of operation

The Autorecloser operation modes shall meet the IEC standards.

8.10.3 Operating Mechanism

The closing mechanism shall charge a spring during closing which drives the tripping mechanism. Solenoid mechanism shall not be used.

The tripping shall be coil initiated via commands from the control/protection system.

8.11 Power Supply

The recloser shall be completely self-contained deriving all its energy from the feeding sideof the HV network. High voltage operated solenoids are preferred. The control and protection facilities may be operated by means of current transformers on the feeding sidebushings. If batteries are provided for control, protection and tripping batteries are provided for control, protection and tripping functions detailed capacity calculations are tobe provided showing the number of in/out operation the battery can handle in addition to the normal control/protection requirements of the stated ambient temperatures. A minimum of 2000 in/out operations are required with a minimum battery life span of 5 years. A low battery voltage signal shall be provided.

8.11.1 Control Cabinet

A separate control cabinet shall be provided connected to the recloser by means of a multicore cable. The cabinet shall have a heater for connection to external power supply. The cabinet shall be dust and vermin proof and protected against direct sunshine by meansof a shade. Ingress of water shall not be possible.

8.11.2 Control Requirements

A microprocessor based control unit for the recloser is required which also integrates the protection relays. The control unit shall have a socket for serial communication and downloading of informationto a hand-held external unit from the memory.

The autorecloser shall have facilities for manual tripping and locking out by means of an external handle or similar.

The following control functions shall be provided on the front panel:

- Local/remote control selection
- closing/tripping
- Autoreclose in/out (one trip to lockout)
- Protection engaged/disengaged
- Earth fault in/out
- Sensitive earth fault in/out
- Relay status.
- Energy profiles;
- Demand registers

Local status indications shall be included in addition to the above control functions. The control unit shall also have facilities for remote control/indication.

8.11.3 Protection Requirements

Relay characteristics settings shall preferably be performed on the front panel as well as selectionof the operating sequence.
Dead times and reclaim time shall be selectable in steps. The protection system shall have facilities for:

- phase faults
- earth faults
- sensitive earth fault.

The phase and earth fault protection shall have standard inverse IDMT characteristics and definite time. The trip setting range for phase faults shall minimum cover 20 to 800 A while for earth faults 10 to 400 A.

The sensitive earth fault relay shall be of the definite time type with instantaneous element, adjustable between 2 and 10A in steps. Time delay should be settable between 0 and 20 secs. in steps.

The relays shall be equipped with in rush restraint facilities. A counter is to be provided to keep record of the number of in/out operations.

8.11.4 Insulating and Interrupting Medium

The interrupting medium shall be vacuum. The insulating medium shall be SF6 or solid insulation. The SF6 gas used shall comply with IEC publication 60376.

Unless otherwise stated, the insulating oil used with autoreclosers shall be of the standard mineral uninhibited type and shall comply with the requirements of IEC 60269. In addition to the quantityof gas required to fill the supplied equipment, 20% shall be supplied as spare.

Where SF6 gas filled autoreclosers are offered, the supplier shall provide the user with necessary instructions for refilling the gas and maintaining its required quantity and quality. The autoreclosershall have facilities for lockout in case of low pressure with an associated indicator flag easily seenfrom the ground. A pressure gauge easily read from the ground shall also be provided.

Reclosers using oil as interrupting medium are not acceptable and will be rejected. Where

gas filled reclosers are offered the supplier shall include in the quotation the cost of one set of gas fillingequipment. One set of gas filling equipment shall be supplied with the reclosers.

8.11.5 Ratings

a) The reclosers will be used on networks with nominal operating voltages of 33kV. The maximumsystem voltage will be 36 kV. The rated one minute power frequency withstand voltage shall be at least 95 kV when contacts are opened with Basic Insulation Level at least 170 kV.

b) The continuous current rating shall be at least 400 A. The short time 3 seconds current rating shall be at least 12kA. The interrupting current shall be at least 12kA. The closing and latching capability shall be at least 20 kA.

8.11.6 Bushing Current Transformers

The bushing current transformers for protection shall be single core and provided on all phases. They shall be rated as per design requirements if not specified.
All transformers above 2.5MVA shall be fitted with line and neutral bushing current transformers. The bushing transformers shall have a minimum of four (4) core, except for the neutral that shallhave a minimum of three (3) cores.

If current transformers are used to provide power supply to control, protection and tripping these are to be dimensioned with 30% spare capacity. The cores for this supply shall be separate from theprotection core.

8.11.7 Alternative Indoor 66kV Switchgear

For very confined substations in the Nairobi an alternative with indoor 66kV switchgear is to be included in the Bid. The 66 kV breaker shall be mounted on a trolley behind a steel wall together withearthing switches and measuring transformers. In principle the arrangement shall be as for enclosed switchgear below with the exception of the enclosure. The steel wall shall protect operators from anydanger followed from live part and possible arching. The motor operated trolley shall act as a disconnector and be retractable from front of steel wall. The earth switch shall also be operated fromhere.

8.12 Medium Voltage Indoor Switchgear (Not applicable in the scope of Works)

8.12.1 General

This section covers the manufacture and supply of indoor metal enclosed, metal clad type 33 kV and11kV switchboards constructed and tested in accordance with IEC60298 as well as circuit breakers, associated equipment and spares.

All bays shall be clearly labelled in English language with feeder or transformer name.

Tests shall be made in accordance with IEC 60298. Arc tests, as specified in IEC 60298 Annex AA are required. The arch type test shall be performed by an internationally accredited testing institutionfor the full short circuit current in at least 1 sec.

The medium Voltage Indoor switch bus bar conductor shall be high grade tinned copper. Aluminiumbus bars shall not be accepted.

8.12.2 Panels

The boards shall be complete with bus bars, Withdrawable circuit breakers, cable connection points,Earthing switches, measuring transformers, cable relays, instruments and

other ancillary equipment, fully wired, but dismantled to individual panels/sections for delivery purposes.

The boards shall be suitable for indoor use and shall be of single bus bar three-phase configuration ata rated frequency of 50 Hz. If so indicated in Scope of Work, the bus bar shall be split by a Withdrawable sectionalizing circuit breaker. In any case shall it be possible to add new boards including such bus coupler at a later stage.
The cubicles shall be short circuit and arch type tested. The switchgear shall consist of cubicles of tropical design. The shall be metal-enclosed with separate compartments for bus bars, circuit breakers, cable termination and instruments, and shall be so designed that future extension can easilybe made.

The rated short circuit current withstand for 11KV indoor switchgear shall be 31.5KA/1sec, whereasfor 33KV shall be 40KA/sec.

The cubicles shall be designed with protection class IP3X for external surfaces and IP2X for internalcompartmentalization.

The panels shall also be equipped with arc protection system, capable of sensing internal arcing andinitiating trip and alarms through IEDs

The instrumentation compartment shall house all secondary equipment. The compartment shall be accessible from outside without opening any of the doors to the H.V. equipment. In cubicles housing voltage transformers, circuit breakers and switch disconnectors, the instrument compartment shall inaddition, contain fuses for secondary circuits and direct-on-line starters for the operating devices.

Internal H.V. connection shall be made of copper or aluminium alloy. The cubicles shall be painted in a colour that will be stated at a later date. Each cubicle shall be labelled and the equipment marked.

The Supplier shall state necessary free spaces behind and above the switchgear for pressure relief purposes. The service side of the switchgear shall be completely screened from shock waves and fume gases.

8.12.3 Circuit Breakers and Disconnectors

The three phase circuit breakers shall be of the vacuum type for 33 kV and 11 kV.

The breakers shall be capable of handling the following operation cycle, according to the IEC recommendations:

0-t-CO-t1-CO t = 0.3 sec t1 = 15 sec

The total breaking time (opening time plus duration of the arc) of the breakers shall be as short as possible, but in no case is it to be longer than 60 msec.

The circuit breakers shall be designed for switching of capacitor banks and shall be such that re-strikingduring breaking operation cannot occur.

A spring-operated mechanism shall be provided and the mechanism shall be equipped for electrical local (from switchgear) and remote control (from control Centre). If not otherwise stated in Scope ofWorks, the control voltage for closing and opening commands and for the operating mechanism motor(s) shall be:

110 VDC + 10% - 20%, unearthed, from battery

A local position indicator shall be mounted in the front panel of the operating mechanism cubicle.

The circuit breakers shall be mounted on manual operated trucks so that they can be moved into counter contacts of the switchgear (draw-out/jack up down type). All breakers of same rating shall befully interchangeable.

Each cubicle shall be provided with facilities for local control and position indications. All trucks for circuit breakers and disconnectors shall be incorporated in the interlocking system.

For SF6 circuit breakers, a system for continuously monitoring the gas density shall be provided. Ata certain low density signal shall be given to indicate that refilling should take place. At the extremelow density the circuit breaker should automatically trip and be blocked against operation. SF6 gas refilling equipment mounted on a trolley shall be provided.

The stored energy shall for all types of operating mechanisms be sufficient to allow a complete O-C-Ocycle.

A sufficient number of auxiliary contacts for 110 V DC shall be provided for control and interlockpurposes.

Motors shall be designed in accordance with valid IEC publication and shall be effectively protectedby miniature circuit breakers, with alarm contacts.

All wiring shall lead to terminals. 10% of the terminals shall be spare.

8.12.4 Circuit Isolation and Interlocks

The arrangement of the secondary isolating contacts, must be such that when the breaker is in the testposition, the secondary isolating contacts are still made so that the secondary circuit may be tested without the need for jumper connections. It must be possible to leave the breaker trolley indisconnector open position with closed cabinet door.
Clearly labelled mechanical interlocks shall be provided to prevent:

(a) a closed breaker from being withdrawn from or inserted into the isolating contacts.
(b) the breaker from being withdrawn or replaced except when its mechanism is in the "off"position.
(c) the breaker being closed in the “service” position when the secondary circuits are notproperly connected.

8.12.5 Switch-Disconnectors and Fuses

Cabinets for station transformers for local LV supply to be equipped with switch-disconnectors, fuseholders and Earthing switches. Such breakers do not need to be erected on trolley but the arch test requirements prevail and the cubicle must be extensible with standard cubicles on both sides. The disconnector must be so arranged that it is possible to insert an isolating plate between the live and deadcontacts when working in the cubicle. Such plate should be part of the supply.

Transformer Cubicles shall be provided with fuse tripping devices via striker pin. The HRC

fuses mustconform to DIN (IEC equivalent) regulation for 12 kV or 36 kV.

8.12.6 Shutter Mechanism

Substantial safety shutters are to be provided to cover the breaker isolating sockets, on both the bus barsand circuit connections. These shutters are to be automatically actuated by the breaker.

Each shutter shall be capable of being separately operated and padlocked in the closed position.

8.12.7 Earthing

All cubicles shall be connected to earth via conductors with min. 50 mm^2 cross section area.

Neutral terminals of voltage transformers shall be connected via separate, insulated conductors to themain earth conductor.

Cubicle doors shall be separately earthed if live equipment is fixed to the doors.

Permanent Earthing facilities shall be installed on all incoming and outgoing feeders and on the bus barin one point (or if split bus bars in each section.). It shall be possible to connect the Earthing devicesfrom outside with closed doors. Earthing devices shall have reliable position indicators and sufficientmaking capacity shall be proved.

Capacitive voltage indicators shall be arranged to avoid closing of earthing switches against energisedcomponents.

8.12.8 Cable Connection

The cable termination compartment for feeders shall have adequate space for housing of cable terminalsup to, 2x3 single core 300mm^2 Al XLPE (two single core set) and shall be complete with cable terminations, bolts, nuts and cable glands.

The cable termination compartment for the connections to the 66/11kV transformers must allow for cables dimensioned for 23MVA.

For cable test purposes, it must be possible to loosen the connection between cables and the measurement transformers from the front of the switchboard, with energised bus bars without removingany apparatus. The Bidder shall demonstrate this in his Bid.

8.12.9 Measuring Transformers

8.12.9.1 Current Transformers

All current transformers shall have bar primaries and shall be Oil insulated, hermetically sealed typeand complying with IEC 60044. Cast resin type from a reputable manufacturer and meeting IEC Standards is also acceptable. All current transformers shall have a maximum short-time current ratingof 25kA for 3 seconds.

Feeder out bays shall be equipped with a current transformer on three phases with four cores:For measuring and instruments, not less than 15VA, Class 0.2

33kV: Ratio 150-300-600/1-1-1Amp

11 kV: Ratio 100-200-400/1-1-1Amp

For overcurrent and earth fault protection, not less than 15VA, Class 5P20.

33kV: Ratio 150-300-600/1-1-1Amp

11 kV: Ratio 100-200-400/1-1-1Amp

For overcurrent and earth fault protection, not less than 15VA, Class 5P20.

33kV: 150-300-600/1-1-1Amp
11 kV: 100-200-400/1-1-1Amp

Fourth core shall be class SP or PX, with Vk =350V, Ik =30mA.
33kV: Ratio: 150-300-600/1-1-1Amp
11 kV: Ratio: 100-200-400/1-1-1Amp

Note: For Busbar protection core as per the design

Incomers shall be equipped with a current transformer on each Phase with four separate cores:

For differential protection, not less than 15VA, Class PX
33kV: Ratio adapted to
transformer rating11 kV: Ratio:
400-800-1200-1-1-1Amp

For Restricted earth fault, not less than 15VA, Class PX
33kV: Ratio adapted to
transformer rating11 kV: Ratio:
400-600-1200-1-1-1Amp

For over current and earth fault protection, not less than 15VA, Class 5P20
33kV: Ratio adapted to
transformer rating11 kV: Ratio:
400-600-1200-1-1-1Amp

For instruments, not less than 15 VA, Class 0.2:
33kV: Ratio adapted to
transformer rating11 kV: Ratio:
400-600-1200-1-1-1Amp

Loose Transformers for Transformer Neutral

(a) Loose single phase current transformers with three separate secondary cores for connection ofRestricted Earth fault Protection and Neutral Overcurrent Protection. This shall apply where the transformer doesn't have bushing neutral current transformer. Ratio as per design.

8.12.9.2 Voltage Transformers

Three phase voltage transformers shall have the following characteristics

Ratio 33000 / 110/ for 33kV
□3 □3

Ratio 11000 / 110/ for 11kV
□3 □3

Accuracy class of 0.2 for the measuring winding and 3P for protection, capacity shall be between 100to 200VA for the protection winding in accordance with IEC 60186.

Bus bar section and each 33kV and 11kV outgoing feeder shall be equipped with a three-phase voltagetransformer.

The voltage transformers shall be equipped with both primary H.V. and secondary L.V. fuses, and shallbe so arranged that the H.V. fuses are not accessible unless the voltage transformer is withdrawn.

The transformer shall be resin encapsulated of the electromagnetic type

8.12.10 Protection and Control

8.12.10.1 General

Each MV panel shall be supplied complete with numeric protection relay and control units. Maximum of two protection functions can be combined in one unit. It shall be possible to block remote control (but not indication) locally. Such blocking shall be indicated remotely. All requirements and facilities described in the Section Control and Protection below shall be incorporated as appropriate.

8.12.10.2 Arc Detection

The complete 11kV board shall be fitted with arc detection devices in the cubicles with a scheme that will instantaneously trip the necessary circuit breakers to effectively isolate the faulty part of the switchgear board. The arc detection devices shall be placed to cover all the HV compartments of each Switchgear panel i.e. Bus bar compartment, CB compartment and Cable compartment: andshall instantaneously trip the appropriate circuit breakers. The arc detection shall be insensitive to sunlight and flashlight. Rapid tripping scheme shall not influence the test requirements given above. The arc detection trip indications shall be available on the SCADA. The scheme is to be approvedby the Project Manager.

8.12.10.3 Optional Equipment and Accessories

Bidders shall advise and quote, in detail for accessories and maintenance tools and equipment that they would recommend is provided with such a switchboard installation.

It is emphasized that full information must be provided as to the costs of replacement materials, suchas gaskets, seals, 'O' rings, spare contacts and mechanisms, etc.

Bidders shall also specify all equipment, and costs, which will be required to maintain the switchgearin a fully operative condition throughout its service life of at least twenty-five years. This should include gas leakage detection equipment, pressure testing equipment, gas cleaning equipment and gasrecharging equipment.

8.13 MV Cables and Accessories

8.13.1 General

All cables accessories and materials shall be in accordance with the latest editions (including all amendments) of IEC and ISO recommendations.

All cables shall be suitable for operation:

- on a system with direct Earthing of the transformer neutral
- under maximum load (ONAF conditions) plus 10 % specified for respectivetransformers
- in the climatic conditions prevailing at site

No joints shall be allowed. Only dry vulcanizing processes shall be used. Special precautions

shall be taken to avoid ingress and spreading of moisture and development of water-treeing. The Tenderers shall document the construction measures used to achieve these requirements.

8.13.2 Conducting material

The conducting material shall be stranded copper or aluminum. The conductor shall be clean, uniform in size, shape and quality, smooth and free from scale, splits, sharp edges and other harmful defects. The conductor shall be in accordance with IEC 60228. The conductor shall be filled with swelling powder to stop axial ingress of moisture.

8.13.3 Cable construction

The conductor shall be covered with:

- An extruded semi-conducting layer
- A layer of dry vulcanized cross-linked polyethylene (XLPE) insulation
- An extruded strippable semi-conducting layer
- A water tight copper or aluminum seal
- A layer of swelling tape to prevent axial ingress of water along the screen
- A layer of Earthing screen of stranded aluminum or copper
- An outer LDPE (low density polyethylene) sheath for water tightness andmechanical protection.

8.13.4 Cable Laying and Routing

The final routing of HV and LV cables in indoor and outdoor installations shall be determined by the Contractor from the directives given in Particular Specifications, and the principles shown in thelayouts on the drawings. All cable routing and arrangement shall be subject to the Project Manager's approval and must adapt to obstacles as tubes and ventilation channels. All penetrations of fire zone separations shall have the same fire classification as the separation itself.

Cables shall be laid on corrosion resistant (aluminum or hot dipped galvanized) cable trays and racksand by raising cables fixed to cable ladders. The trays shall be dimensioned and fixed so that it allowsone man to climb on it in addition to the cable load. Each tray shall have at least 15 % spare capacity.The distance between each tray shall at least be 300 mm. For exposed outdoor installations cables shall be laid in covered cable trenches, plastic or steel ducts, depending on the available space.

Branch offs to individual equipment shall be fixed and supported all the way to the connection box. Cables and cable supports shall be properly fixed and secured against movement under short-circuitand strain caused by erection work. Particular attention shall be given to termination in confined areaswhere personnel may climb under erection and maintenance. Flexible tubes of "spiral type" shall notbe used whereas tubes of "plica" type can.

Low power cables, i.e. cables for control, metering, etc. shall not be run in close parallel to high power cables or earth wires, but shall be run at the greatest possible separating distance. The minimum distances are:

- High and medium voltage versus control and measuring cables 800 mm
- Low voltage power cables versus control and measuring cables 400 mm Necessary EMC consideration shall be taken in accordance with EMC standards.

Additionally, cables for extra low power, i.e. mA and mV circuits and cables connected to low powersolid state electronic circuits, shall be laid in separate sheet steel trays with covers. The DC trip and AC voltage supplies and wiring to main protective gear shall be segregated from those for back-up protection to the greatest extent possible.
Single-phase power cables shall be run in trefoil configuration, single-phase DC power cables shall be run in parallel. Special care shall be taken so that closed magnetic circuits do not form around single phase cables.
Cables below 25mm^2 cross section shall be copper. Larger cross sections may be aluminum. Minimum cross sections shall be as follows:

- Measuring cables for current 2.5mm^2
- Control and other measuring cables 2.5mm^2
- Power cables according 120 % max load current

All cross section must be checked against max load current, allowable burden on measuring transformers, short circuit values, voltage drop, protection requirements and selectivity.
The cables shall be marked with item designation in both ends as well as by entrances in enclosures.The cable marking shall be fire proof.
Cables shall be laid in full runs and not spliced unless approved by Project Manager. Termination ofmulti-stranded conductor ends shall be with a suitable crimped thimble as specified above. All othercable lugs or similar shall be of crimped type adapted to the cable type and cross-section used. The tools used should be special approved for the lugs and cable type used.
The cable supplier's instructions regarding handling and bending radius shall be followed.

8.13.5 Laying-up and Fillers of Three Phase Cables

The cores of three-phase cable shall be laid-up together with suitable fillers, wormed circular and binding tapes applied overall.

8.13.6 Manufacturer's Identification

The manufacturer's identification shall be provided throughout the length of the cables by means ofa tape under the sheath printed with the manufacturer's name. Alternatively, the manufacturer's identifications may be embossed on the outer PVC sheet together with identification and voltage markings

8.13.7 Armour

All cables shall be steel wire armoured according to approved manner and IEC/BS standards

8.13.8 Testing

Notwithstanding that cables are manufactured to approved standards, all cables, accessories and materials shall be subjected to and withstand satisfactorily the test requirements detailed in this specification. All materials shall withstand such routine tests as are customary in the manufacture ofthe cables and accessories included in the Contract. The manufacturer shall have established a qualitycontrol system based on regularly accelerated test of production samples according to CENELEC HD605. This system shall be described in the bid.

8.13.9 Sealing and drumming

The cable shall be wound on strong drums arranged to take a round spindle of a section adequate to support the loaded cable drum during installation and handling. The drums shall

be lagged with closely fitting battens that shall be securely fixed to prevent damage to the cable. Wooden drums shall be constructed of seasoned timber to prevent shrinkage of drums during shipment and subsequent storage at site. Each drum shall be clearly marked including indication of direction of rolling. The ends of the cables shall be suitably sealed to prevent ingress of moisture. The end of the cable left projecting from the drum shall be securely protected against damage by mishandling during transport and storage.

8.13.10 Current carrying Capacity and Design Parameters

The maximum continuous current carrying capacity and maximum permissible continuous conductortemperature, and the factors for determining such rating and temperature shall be based on recommendations found in IEC 60287, subsequent amendments and all conditions prevailing on theSite

8.13.11 Terminations

Detailed drawings showing the types of cable sealing ends, terminal arrangements shall be submittedto the Project Manager for approval. Stress cones or other approved means shall be provided for grading the voltage stress on the core insulation of the cables.
The terminations and joints for the cables shall be of an appropriate heat shrink or cold type jointingkits incorporating a suitable arrangement for stress control, and rain sheds for outdoor use.
Termination kits shall include suitable heat shrink tubing to effectively shroud, seal and insulate theexposed cable conductor and shall include a heat shrink glove to effectively seal the crutch of the cable to prevent ingress of moisture into the interstices of the cable. Suitable arrangements shall be provided to earth the cable screens and armour
Terminations into cable boxes shall include brass compression glands and back nuts of the correct size, which shall secure the cable outer sheath and ensure effective continuity between the cable armouring wires and the metal enclosures on which the cables are terminated. At all rising terminations the cable inner sheath shall pass through the gland to terminate not less than 6 mm abovethe gland.

8.13.12 Joint and termination material

Heat shrinking tubing and moulded parts shall be flexible, flame retardant, polyofin-based material of electrical insulating quality, and shall be obtained from an approved manufacturer. They shall be suitable for use indoors or outdoors in the conditions prevailing on site
The material shall reduce to predetermined size and shape when heated above 120 °C. The components shall also be provided with an internal coating of hot melt adhesive compound that shall not flow or exude at temperature below 85 °C. All parts and materials shall be tested to a program oftests to be agreed with the manufacturer.
Each part shall bear the manufacturer's mark, part number and any other necessary marking to ensurecorrect identification for use on the correct size and type of cable. Each set of parts shall be packed as one unit with full and complete installation instruction and clearly marked to show the application.

8.14 Auxiliary Supply and Substation Lighting

8.14.1 General

This section covers the technical requirements of the low voltage AC and DC supplies, switchyard lighting and other auxiliary equipment.
The station service is to be supplied from the station transformers. If available a back-up supply fromthe district grid may be brought in to the station. No more than one station

transformer shall be connected to the bus at any time. If the voltage disappears the supply shall automatically be switchedover to an alternative supply if such is available.
From the main low voltage switchboard, (AC and DC) feeders shall supply the sub-distribution boards of the plant.
Domestic installations are part of the Civil Works.

The temperature rise of the conductors above ambient air shall not exceed 40°C at rated current 1250A in the three phases.

8.14.2 Switchboards and AC distribution Panels

The switchboards and panels shall be designed, constructed and tested in accordance with IEC 60439:Low-voltage Switchgear and Control gear Assemblies.
The boards shall be vermin proof. The boards and panels shall be self-ventilated. No ventilating fansshall be used.
Permissible temperature rise shall not be exceeded even when the free space available for future feeders is mounted with feeder equipment and loaded with rated current.
The covers (outside covers and doors, including hinges and locks) shall safely withstand the overpressure caused by short circuit currents and shall protect personnel against injury.
The main switchboards and the larger ones of the sub-distributions shall be of the floor mounted prefabricated metal enclosed type, with separate compartments for each feeder, etc. Small sub- distributions may be of the wall mounted steel sheet or cast metal type.
All boards and panels shall be designed for easy access to the equipment, cable terminals, etc. duringerection, maintenance, disassembly and extensions.

In addition to the required number of outgoing circuits, one more of each rating employed shall be fully equipped ready for connection of future circuits. Furthermore, each board and panel shall haveat least 20% free space available for future extensions.
The main switchboard shall be designed so that additional panels can be added in the future (includingpossibilities for extending the bus bars).
Operating handles, operating switches and push buttons, signaling lamps, position indicators,instruments, etc., shall be placed on the fronts. Relays which are not incorporated on the circuitbreakers shall be placed in separated compartments, metal shielded from the current carrying parts. The bus bars shall be of copper and shall have three phases and neutral. A grounding bar of coppershall also be provided and a grounding conductor connection shall be brought to each feedercompartment, where the feeder grounding conductor can be connected to it.

8.14.3 Circuit Breakers ad Fuses

In general, circuit breakers shall be used for all feeders and distribution circuits. Miniature circuit breakers, MCB's, may be used on small circuits. The breakers shall be rated for full short circuit power. No back up fuses shall be used.
Fuses may be used in exceptional cases such as on very light loaded circuits, or in combination withsmall contactors and where the use of fuses is justified for the purpose of selectivity.
In the design of the distribution systems and in the selection of circuit breakers, MCB's, fuses and protection relays due attention shall be paid to the selectivity of breaker tripping at overloads and at short circuits. Full selectivity shall be achieved, only the feeder or circuit which has an overload or short circuit shall trip.
Un-delayed MCB's shall be used only as the last breaker of a circuit. Selectivity between MCB's andfuses shall be proved, with ample margin.
The circuit breakers shall be manually operated, except for the breakers in the feeders from the auxiliary transformer which shall be electrically operated.
All circuit breakers and MCB's shall have three-phase overload and short circuit protection

to be provided as a part of the breaker assembly or provided separately as for the transformer circuit breaker(in this case separate current transformers shall be included). The ratings of the overload and the shortcircuit protections shall be selected according to the current rating of the cable or circuit to be protected, and in accordance with the requirements of the selectivity as stated above.
The breakers for DC shall be two-pole, and with thermal overload and magnetic short-circuit protection in both poles. All such circuit breakers, miniature circuit breakers, switches, contactors, fuses, etc., shall be of a type specifically designated for the use on DC, and the dynamic current andthe making and breaking capacities shall be ample for the short-circuit power of the batteries.

All DC circuit breakers, miniature circuit breakers, switches and contactors shall have an alarm contact or an under voltage relay with alarm contact shall be provided.
Circuit breakers on the main DC switchboards which are rated 50A and higher shall be withdrawable

8.14.4 Current Transformers

The current transformers shall have synthetic resin insulation or equivalent dry insulation.

The cores for measuring purposes of current transformers shall have accuracy class 1 and instrumentsecurity factor less than or equal to 5. The cores for protection shall have accuracy class 5P and accuracy limit factor greater than or equal to 10.

Power frequency test voltages, 1minute:

- Overvoltage inter-turn test 3.5 kV
- Secondaries 2.5 kV

8.14.4.1 Instruments and Relays

The instruments shall be 96 x 96 mm square pattern with (at least) 90° pointer deflection.

Instruments shall be of the three element type, for unbalanced three-phase load and loaded neutralconductor.

The relays shall preferably be of the solid state type. The instruments and relays shall, as far asapplicable, be of the same make and type as those of the other parts of the plant.

8.14.4.2 Tests

Tests shall be made in accordance with the applicable standards.

8.14.5 Auxiliary Supply (415/240Vac)

Three phase auxiliary supply is part of the scope and installation subject to approval by theemployer

8.14.6 Auxiliary Transformers

Station transformers are part of the scope of supply and installation.

8.14.7 Distribution Boards

Current carrying capacity of main transformer circuit breaker and alternate supply shall not be less than 200A. The two sources shall be switched by a changeover system that will select between the sources and shall be arranged within the main board and incorporate a manual

by-pass switch.
For 7.5MVA Substations and above the changeover system shall be Automatic with 240VAC controls circuits with auto and manual operation selection.
The board shall be equipped with instruments for measuring of current and voltage in all phases bothon the incoming lines and bus bars. Also incorporated shall be phase failure relay, phase rotation relays and energy meters for recording of energy consumption. The Bus bars shall be copper with continuous current rating of the phases and neutral from the transformer and alternative source in themain switchboard be at least 200 A. The current rating of the feeders shall be ample for the actual load and have at least 50% reserve capacity compared to the actual load.
The figures given in these specifications are indicative only. Only a limited number of different makes, types and ratings shall be used, for the purpose of standardization and interchangeability.

8.14.8 Switchyard Lighting

The switchyard lighting shall be by means of floodlights with 400W for bay lighting and 70W for perimeter lighting. The lighting shall be constructed with high pressure sodium lamps. The housing shall be of high pressure die-cast aluminium with a non-corrosive finish. Refracting front covers of etched vandal-resistant polycarbonate shall be provided. The enclosure protection shall be min. IP65. The switch bay and transformer illumination level shall be 50 lux on 0.85m height in the switchyardand for the transformers. The perimeter illumination level shall be 5 lux. The perimeter lighting shallbe controlled by photocells. All necessary supports, fixing material and cabling from the distributionboard shall be included.

8.14.9 DC Emergency Lighting

Emergency lighting shall be provided for 23MVA substations and above as specified under Civil Works.

8.14.10 Hand Lamps and Portable Hand Sets

The portable battery handsets are for additional DC lighting during maintenance works, etc., in caseof AC failure. A locker, with the provisions of housing two handsets, shall be placed in the entrancehall of the substation. AC socket outlets shall be fitted in the locker for continuous charging of the batteries. The charging control shall be automatic and a pilot lamp shall indicate that charging is on. The handsets shall be provided with on/off switch.
The handset shall give flow of approximately 200 lumen, and the battery shall have the capacity of running the lamp for 2 hours. A type with a short fluorescent tube is preferred.

8.14.11 Clock

A clock shall be installed in the control room. It shall be of the analogue type, having continuously moving hands. For temperature variations between -1 and +40°C with ambient relative humidity of up to 80%, the clock accuracy shall be better than +/-2 seconds deviation in 30 days.

8.15 DC SUPPLY

8.15.1 General

This section covers the technical requirements of the batteries and battery chargers, the main DC switchboards and the sub-distribution boards and panels for the DC auxiliary supply of the plants.

8.15.2 110VDC Battery and Charger system

The DC bus bars shall have two poles. The bars and the connection conductors to the breakers shall be insulated. All boards shall have instruments for reading of voltage and current (two directions) and be equipped with relays giving alarm by high and low voltage and by earth leakage in all insultedpoles. 110VDC shall be used for the main circuits of the control and protection and for DC motors, unless otherwise stated in Scope of Works.
For 23MVA Substations and above the 110VDC shall comprise of two independent systems i.e. double batteries and chargers allowing one system to carry all loads while the other system is out ofservices or when boost charging one battery. The two 110V batteries shall be located in separate rooms. Under normal operational conditions the two systems shall each carry 50% of the load. Trip 1 circuits and trip 2 circuits shall be connected to separate systems.
All boards and panels shall be supplied with the necessary internal wiring. Battery connections and cabling in the battery rooms shall also be included.
Miniature circuit breakers and DC distributions for control, protection, etc., and which are placed onthe control, measuring and protection boards shall be included in those boards.

All instruments and protection relays on the rectifiers and on the boards and panels shall be included.

Starters, contactors and protection for motors shall be included whenever such equipment is not provided as part of the motor supply.

For 7.5MVA 33/11kV substation voltages and below the battery bank systems shall be 110Vdc/265Ah and 48Vdc/165Ah. Single battery and Charger system shall be installed to carry all the substations DC loads for at least 10 hours with the failure of AC system.

8.15.3 110V Batteries

The Contractor shall calculate and determine the battery capacities, the power ratings of the chargers,the number of sub-distribution boards, the number and size of circuits, etc., to suit the requirements of the equipment to be installed, but also considering the future extensions as indicated on the drawings.

The number of cells shall be selected so that the voltage of the battery does not exceed 110% of the rated voltage during float charging.
The capacities of the batteries shall be selected to permit a 10 hour service without AC power with DC loads as specified below. At the end of this period the voltage of the DC networks (measured onthe bus bars of the main distributions) shall be at least 90% of the rated voltage with the batteries being loaded as specified.
The 110V batteries shall be loaded with the switchyard load. Alarms shall be provided for battery faults.

The batteries shall be of the Nickel Cadmium type, with a nominal cell voltage of 1.2V.

The polarity of the cells, and of the complete battery, shall be engraved and easily legible. Bolted insulated interconnections between the cells shall be included.

8.15.4 110V Charger

The rated current of the battery chargers shall be selected to allow for recharging a fully discharged battery in 5hours, in addition to simultaneously supplying the DC load.

In addition the chargers shall comply with the following technical data and requirements:

Power supply	Three-phases 415VAC
Output voltage adjustable between	110 V ±15%
Stability of the output voltage	less than ±1% for the maximum input voltage and frequency variations, and from 1% to 95% of rated output current
Batter type to be charged	Nickel-cadmium, maintenance type
Nominal Voltage of cell	1.2V per cell
Maximum deviation of the current limitation	+/- 2% of rated current
Ripple of output voltage	
without the battery connected	less than 4% peak-peak of the rated output voltage
with battery connected	less than 1% peak-peak of the rated output voltage

Dry type transformers and solid state (thyristor or transistor) rectifiers shall be used throughout. Eachcharger shall be supplied with reactor to reduce ripples.

The chargers shall be completely equipped for a fully automatic and controlled charging and float charging of the batteries, and shall be of a constant voltage type with current-limiting device.

Each of the charges for the 110V or 48V batteries shall be rated to maintain normal charging and float-charging of both batteries.

By means of an automatic change-over switch the charger shall change from normal charging and float-charging to boost charging of the battery. After the boost charging, the charger shall switch backto float charging.

Each charger shall be complete with instruments, breakers and protection, including but not limitedto:

- Breakers and protection on AC and DC side, with alarm contacts
- One V-meter for the DC voltage
- One A-meter for the DC current
- One lamp indicating that the charger is charging
- Alarms for "high volts", "low volts", "earth fault" and "fail"

The above devices shall be placed on the front of the charger cubicle and the alarms shall also betransferred to the National Control Centre.

8.15.5 Battery Conductors and Fuses

Conductors from the batteries to the fuse boxes shall be installed in short circuit and earth fault proofconduits. That is, the conductors shall be single pole insulated and in addition placed on insulators, separate for each pole. All conductors shall be placed at minimum 5cm distance from each other, even at crossings. The conductors shall lead through insulating pipes in the wall of the battery roomto closed fuse boxes made of insulating material on the wall inside the battery room. For the 110V and 48VDC system there shall be separate fuse boxes. The wall-holes shall be tightened against gas intrusion.

8.15.6 48VDC Battery and Charger System

The batteries and charger shall be suitable for continuous indoor operation in tropical areas with thefollowing atmospheric conditions.

(a) Altitude: 2200m above mean sea level
(b) Pollution: heavy saline atmosphere
(c) Humidity: up to 90%
(d) Ambient temperatures of +30□ C average, (+40□ C Max. and -1□ C Min).

The battery and charger sets shall be sized to adequately supply the loads to be connected to thebattery. The rectifier output shall be k x S where

k = 1.5
S = sum of the following:

- input power in kVA of the largest tendered RTU
- input power to the new telecommunication equipment provided under the contract.

The battery capacity shall be C = 1.5 x C_n, where C_n is the capacity to feed the above total load for eight (8) hours. This requirement shall be tested during SAT.
The battery chargers shall provide normal system power and shall be capable of recharging a fully discharged battery in twelve hours while supplying normal system power. The chargers shall have 240Volt, 1 phase input power.

The batteries shall be minimal maintenance Vented Nickel cadmium type. As they are vented, there are no special ventilation requirements, and as such the batteries shall be placed in battery room installed with correct rated controlled exhauster fans.
A low voltage disconnect switch shall be provided for protection of the battery. The 48 Volt DC system distribution panel shall be a fused switch distribution panel board. The low voltage disconnectswitch and fuse panel shall be provided with local alarms as well as alarm contacts. The low voltagedisconnect switch shall be equipped with external by-pass switch to be used for maintenancepurposes.
Detailed drawings and operations manuals shall be provided in duplicate copies and softcopy. Designdrawings shall be provided for approval before manufacture.

8.15.6.1 48VDC Batteries

The batteries shall be of minimal maintenance vented Nickel cadmium type. The type and rating shall be in accordance with the prevailing environment and supply standard voltage level. The batteries shall be mounted on wood or metal stands or racks in a way that all plates of each cell are visible for maintenance purposes. The stands or racks shall have a maximum of two tiers.

The Contractor shall be entirely responsible for carrying out and completing the initial charge, test discharge and subsequent recharge. The final test discharge shall be made at the site.

8.15.6.2 48V Charger

The battery charger shall operate satisfactorily with input AC supply single phase 240V +-15%, 50 Hz +-2.5 Hz, harmonic level H4 (less than 20%).

On the input of the rectifier/battery charger there shall be an isolating transformer.

The charger shall be of a modified constant voltage type (constant voltage and current limit) capableof providing a continuous float charge to the batteries with at least C/20 A current when delivering the total inverter rated load.

The charger shall be equipped with a total current limit and a separate battery current limit (10 - 50%of total rectifier current), independently adjustable for each of the charging modes:

Trickle charging and floating operation 2.3V/cell and stand-by parallel operation 2.23V/cell shall bepossible.

Controls shall be provided to vary the DC voltage within the output range. The DC voltage shall remain constant within ±2% of its pre-set value over the full current range of the rectifier/charger andsimultaneous AC mains fluctuations 400V ± 15%, 50 Hz ± 2.5 Hz.

The output ripple shall not exceed 1% peak-to-peak measured across the output of the charger whenconnected to its associated battery.

In the output of the rectifier there shall be a fuse with alarm contact on the negative terminal only (positive earthed system).

When the battery is connected to the charger the psophometric noise level at the output, for loads between 0% and 100%, shall not exceed the equivalent of 1 mV at a frequency of 800 Hz after weighting as specified by CCIF.

8.15.6.3 Alarms and metering

The following alarms and indications shall be provided:

rectifier failure: high/low DC voltage, mains failure,
rectifier faultbattery breaker status
status of the on-load isolating switches.

The following metering instruments (class 1.5) shall be included in each rectifier:V-meter for rectifier input
A-meter for battery current V-meter for rectifier output A-meter for rectifier output.

8.15.6.4 Inspection and Testing

The batteries shall be tested in accordance with the requirements of IEC 60285 and Kenya Bureau ofStandards.

reserves the right to inspect the equipment for acceptance tests, at the manufacturer's place where routine tests and temperature rise shall be performed. Test certificates for Batteries and chargershall be provided.

8.15.7 Specifications for GPS device

Description	KAA'a requirements
Make/Model	Specify
Display size, WxH	Specify
Display resolution, WxH	Minimum 272 x 480 pixels
Display type	bright, transflective 65k color TFT, dual-orientation touchscreen; sunlight readable
Weight	Specify
Battery	rechargeable lithium-ion
Battery life	up to 16 hours (lithium-ion);
Water rating	IPX7
High-sensitivity receiver	Yes
Interface	High-speed USB
Maps & Memory	
Basemap	Yes
Preloaded maps	yes (topographic), some models
Ability to add maps	Yes
Built-in memory	6 GB (With Worldwide base map); 3 GB (WithTOPO U.S. 100K Maps)
Accepts data cards	microSD™ card (not included)
Waypoints/favorites/locations	4000
Routes	200
Track log	10,000 points, 200 saved tracks
Features & Benefits	
Automatic routing (turn by turn routing on roads)	Yes (with optional mapping for detailed roads)
Electronic compass	Yes (tilt-compensated 3-axis)
Touchscreen	Yes
Barometric altimeter	Yes
Camera	yes (8 megapixel with autofocus and 1080p/30fps video; LED flash; automatic geo-tagging)
Geocaching-friendly	Yes (Paperless)
Custom maps compatible	Yes
Photo navigation (navigate to geotagged photos)	Yes
Hunt/fish calendar	No
Sun and moon information	No
Tide tables	No
Area calculation	Yes
Custom POIs (ability to add additional points of interest)	Yes

Unit-to-unit transfer (shares data wirelesslywith similar units)	Yes
Picture viewer	Yes
Additional Features	• Bluetooth® wireless technology • Wi-Fi connectivity • ANT+™ connectivity: • GNSS support: yes (GPS + GLONASS) • Near Field Communication (NFC): • Microphone: yes (internal for audio capture) • Multimedia (audio/video) support: • UV sensor

PARTICULAR TECHNICAL SPECIFICATIONSFOR TELECOMMUNICATION

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9 Telecommunications

9.1 General requirements

The objective of the telecommunications system is to transmit and receive data, voice and Teleprotection signals. Telecommunication links based primarily on Fibre (OPGW and ADSS) multiplexers and on some cases Radio and PLC shall be established linking various equipment in substations to Regional Control Centres (RCCs). Necessary engineering required for transmittingdata and speech signals to the Regional and National Control Centre(s) shall be included. The links shall consist of STM-1/4/16 SDH Terminal equipment(s), and shall be connected to existing network. has SDH network with the backbone mainly consisting of STM-1/4/16 network.

The telecommunication system to be provided shall be designed to transmit and receive data, voice, and Tele-protection signals where necessary.

Where the station is for Voltages above 66 kV the SAS/RTU and Telecommunications links shall be configured to have connection to both Regional and National Control Centres. These links shallinclude Tele-protection facilities with for four commands per line. For 33kV substations with a transformation capacity of less than 23MVA, the links shall be designed for connection to respective RCCs. .

These specifications describe the basic requirements for the Telecommunications various systems. Tenderers are requested to submit with their offers the detailed catalogues, brochures and technicaldrawings with the specific items on offer clearly marked for the products they intend to supply. Tenderers must indicate on the specifications sheets whether the equipment offered comply with each specified requirement.

The tender documents shall be accompanied by type test and routine test reports certified by the National Testing or the National standards Institute of the country of origin. At her discretion, allequipment shall be subjected to inspection by the clients Engineers or representative at the place of manufacture where all routine tests on randomly picked sample(s) shall be carried out in their presence. Test reports shall be completed for each equipment and made available to after the tests have been carried out. All the dimensions and capacities of the equipment to be suppliedshall not be less than those required in these specifications. Deviations from the basic requirements, if any, shall be explained in detail in writing with the offer, with supporting data such as calculation sheets, etc. The Procuring entity reserves the right to reject the products, if such deviations shall be found critical to the use and operation of the products.

9.2 ADSS Cable

Where required in the specific line scope of works the ADDSS cable shall meet following technicaland general requirements. ADSS can only be installed in an existing 33kv lines, and in that case it shall be specified in the specific scope of works.

i. Design Principles:

The proposed Fibre cable shall be single mode, 48 core all-dielectric self-supporting cable(ADSS).

The cable shall be designed and manufactured in accordance with the following standards:

- Cable IEEE 1222
- Fiber IEC 60793, ITU-T G.65X series
- Color code ANSI/EIA 359-A, IEC 60304

ii. Route Survey:

Prior to design and installation, the contractor shall visit the route accompanied by staff to ascertain for themselves the requirements for the link. During this survey a pole count and a sketch for the cable installation shall be carried out. This sketch shall indicate the locations of splice boxes and the approximate distances between them. The poles shall also be assessed for their ability to support the ADSS cable. Any need for modification shall be determined at this stage.

Suitable drum lengths shall also be determined at this stage to reduce the number of joints preferablyat section poles. shall assess the contractor's report and carry out modifications where it is felt necessary.

iii. Installation:

The cable installation shall be aerial on existing power lines. Majority of these lines are on wooden structures and the ADSS cable shall be installed below the power line. The installation shall be doneunder live line conditions except in some instances where safe working clearance cannot be maintained.

It is not the intention of the employer to recommend any specific installation method but whichever method applied should be in accordance with the international standards, manufacturer's recommendation and within safety regulations.

iv. Installation Materials & Fittings:

All bolts, nuts and clamps used during the construction shall confirm to IEEE standards that apply totesting and performance of Hardware for All-Dielectric Self Supporting cable (ADSS) All fitting materials shall conform to the approve standards by IEEE1222. The bidder shall attachtype test certificates from the certifying bodies

v. Splicing & Testing:

All joints shall be fusion spliced. The splice loss shall be equal to or less than **0.1db**. After all the terminations are done the cable shall be tested from ODF to ODF using the OTDR as well as powermeter and the results tabulated.

vi. Fittings & Spare Capacity

Unless otherwise specified in this specification, all requirements for individual components and completed cable shall be mainly in accordance with the following standard specifications.

1EE Std 1222, IEC 60794-4, IEC 60793-1, IEC 60793-2, IEC 60794-1, ITU-T G.650, ITU-T G.652,ITU-T G.655, EIA 492A, EIA 472A, EIA 598 or ANSI/EIA 359-A-1985, ISO 9001 and ISO 14001.

The Contractor shall include 10% spare cable capacity for future maintenance work on the link atagreed intervals.

9.2.1 Fibre Optic Ground Wire (OPGW)

The overhead earth wire shall be Fibre Optic Ground Wire (OPGW) with a minimum of 48 strands. The Fibre optic earth wire supplied shall be suitable for installation on transmission line and shall besupplied complete with all necessary fittings and optical joint boxes. The earth wire fittings and optical joint boxes shall be type approved.

The manufacturer of the OPGW shall be responsible for the supervision of installation by the Contractor; to ensure that system reliability requirements are met.

The fibre optic earth wire shall comprise an optical sub-unit containing optical fibres over which shallbe laid aluminium, aluminium alloy or aluminium coated steel strands. The clad

steel wire incorporated in fibre optic earth wire shall comply with the requirements of IEC 61232. Shaped aluminium or aluminium alloy wire sections shall conform to the requirements of the appropriate IECstandard.

The optical sub-unit shall withstand the temperature rise associated with the specified lightning faultcurrent flowing in the earth wire without damage. The fibre optic earth wire (OPGW) shall be manufactured in continuous lengths of not less than 4,000 m.

The overall system design of the fibre optic system shall meet the following minimum requirements:Single failure or degradation in any optical fibre not more than one year averaged over five years; Failures or degradations affecting more than one optical fibre, not more than one in ten years; Increase in optical system transmission attenuation due to accumulated ageing and other effects atthe end of five years and not more than 0.05 dB/km.
The Contractor shall ensure that the fibre optic cable are not strained or damaged either mechanicallyor optically during stringing and/ or jointing.
The cable shall be capped before shipment to prevent the ingress of water.

i) Optical Fibres

Optical fibres shall be 48 core single mode and shall conform to IEC 793-2-BI. The fibre coating material shall be mechanically strippable. The optical fibres shall be capable of being jointed by fusion technique.

There shall be no measurable long term or short-term optical attenuation change due to the temperature rise associated with a fault current flowing in an earth wire, or a lightning strike on the earth wire.

ii) OPGW Fittings

The fibre optic earth wire shall be with approved conductor fittings. The application of these fittingsshall not damage the earth wire or fibres, either mechanically or optically.
At each support, a bypass device shall be provided to guide the cable around the earth wire fittingsassociated with the support.

iii) Optical Joint Boxes

Optical joint boxes shall be provided to protect the splice joint of optical fibres, either when individuallengths of the fibre optic OPGW, are jointed or between the fibre optic earth wire and the undergroundfibre optic cable.
The joint boxes shall consist of external steel or die cast aluminium housing providing protection toIEC 529 IP 44 and an internal die cast aluminium or high impact plastic ABS box to IEC 529 IP54 The external housing shall be designed so that the rainwater is directed away from the door and thereshall be no water ingress when the door is opened.
The joint boxes shall be supplied complete with all fittings to secure and seal the cable in the gland plates or blank the unused spigots. The cable cleats to secure the fibre optic OPGW or underground cable shall be fitted inside the box. The cleats shall not have a detrimental effect on the performance of the optical fibres when tightened to the recommended torque.
The top and bottom of the joint box shall be vented and the vents provided with the vermin shields. The box shall be supplied complete with internal splice cassettes to accommodate the requirednumber of splices. The glands shall be fitted to accommodate either the fibre optic OPGW orunderground fibre optic cable.

iv) Fixing Clamps

A bolted clamping system shall be used to attach the OPGW to the inside of the support, without drilling or modifications to the support steel work. The attachment clamps shall be capable of beingattached and detached from the support, without affecting the OPGW. Fixing clamps shall be made from a suitable grade of aluminium alloy complying with the requirements of BS 1490 and / or BS EN 1676. Bolts shall be made from mild steel grade S275JR to BS EN 10 025. Bolts and nuts shall be ISO Metric Black Hexagon to BS 4190 and shall unless otherwise specified be threaded ISO Metric Coarse Pitch to BS 3643: Part 2, Tolerance Class 7h/8g.

9.2.2 Non-Metallic Underground Fiber Optic Cable

Where required, the fibre optic cable shall be circular in cross section and shall be designed so that any cable strain is so directly imported on the optical fibres. The cable shall not include any metalliccomponents to prevent high-induced voltages when used in switching or substation compounds.

9.2.3 Approach Fiber Optic Wire:

The ADSS/OPGW cable shall terminate at first structure after the bus bar at the substations. An underground fiber optic cable shall be run from this structure to the building. This approach cable shall be 48 core SM, armored, loose tube cable, with a dielectric central member. The cable shall beKevlar yarn reinforced, steel tape armor and a UV resistant HDPE outer layer. It is for outdoor applications, in ducts, for direct burial or latched installations

9.2.3.1 Optical Distribution Frames (ODF)

The optical fiber distribution frame (OFD) is installed for terminating optical fiber cables and patch cord. The distribution frame should include the metallic casing, adapter plate, splice tray, and other necessary materials for the termination of optical fiber cable. Therefore it should be designed properlyfor the fiber splicing and distribution. Separate storage shelf and distribution shelf can be offered if required. The OFD shall be of corrosion resistance and robust construction; and shall allow both top or bottom entry for access to the splice trays. Specific selection of the entry points shall be made at the time of installation. The OFD shall be installed on the international standard (ETSI 19") equipment rack or cabinet rack. The optical fiber distribution frames shall include all necessary partsto complete the joint. This will comprise all components to protect and store the spliced fiber; and provide sheath continuity. The distribution frame shall be designed with enough spare capacity for fiber splices. The distribution frame shall be made from fabricated mild steel not less than 1.2mm thick or equivalent and painted in good condition. The design of the fiber distribution frame shall allow minor deviations from the ascribed installation procedures without any harm to the fibers and the long-term performance of the installation. The shelf and the connection between shelves shall bedesigned to maintain minimum bending radius of 30mm. the connectors to be used shall be subject to approval by the Project Manager.

Assignment between station fibre cable and OLTE's shall be made by using patch cords between the termination box and the optic distribution frame. Capacity of the optic distribution frame shall allowfree assignment between each individual fibre of the station fibre optic cables and the relevant opticalI/O ports of the OLTE's.

The optic distribution frame shall be equipped with low loss optical connectors (< 0.25 dB includingthe loss in the bulk head, loss in the connector splice & the loss in the pig tail) of the screw-on type. Auxiliary connectors shall be provided to facilitate testing and

maintenance of the fibres/equipment.All spare fibres shall be properly terminated and spliced on connectors of the same type within the frame

9.2.4 Fiber Terminal Equipment

The terminal equipment shall be the type SDH STM-4 optical terminal equipment and shall besupplied from 48VDC source.
SDH (STM-1/4/16) multiplexer shall be installed in racks that are EMC compatible and suitable towork in HV system environments.
The multiplexer shall be based on the SDH technology, working on the basic transmission Bit Rate of
155.520 Mbit/s (STM-1/4/16). It shall be in accordance with the latest ITU-T SDH recommendationssuch as: G.703, G.704, G774, G.783, G.784, G.785, G.811, G.812, G.813, G.823, G.825, G.826 andM.3010.

The equipment shall be able to perform both, multiplexing and line terminating functions. The SDH Equipment (Terminal Equipment, Add/Drop Multiplex, and Synchronous Digital Cross-Connect) to beoffered shall meet the following requirements:

- It shall have at least all the functions outlined in ITU-T G.783.
- The PDH electrical tributary interfaces to the SDH equipment shall conform to ITU-T G.703.
- The SDH electrical and optical interfaces shall conform to ITU-T G.703 and G.957.
- The cross-connect offered shall be capable of providing non-blocking connection betweenvirtual containers.
- The Optical Power to be offered shall be such that under normal operating condition, the BERof the system at the receiver is better than $1x10^{-10}$. Error performance versus the receive signalshall be verified during the factory acceptance tests.

The multiplex structure shall conform to ITU-T G.707. Details of the Multiplex structure for the offered equipment including the usage of the overhead bits shall be detailed with the offer.
The synchronous optical interface protection shall be achieved by having 1+1 protection. The lasershall automatically cut-off when the link is disturbed. Redundant cross connect, where failure on either one shall not cause link outage, and path protection on the traffic interface and the 2 Mbit/slevels shall also be provided.

Timing and synchronization shall conform to ITU-T G. 783, G.811, G.812 and G.813. Timing references, number of timing references available, switching time to a different timing reference,type and level of clocks shall be stated in the offer.

The equipment shall automatically switch to another clock if the reference timing is lost and automatically revert back upon restoration. The accuracy of the internal clock as well as the detailsof the clock signal distribution shall also be stated in the offer.

The equipment shall be capable of diverting timing references between the STM-1, 2 Mbit/s and aG.703 tributary interfaces.

The SDH equipment shall be wired for the full STM-1/4/16 capacity, however equipped under thescope of this specification to receive at least four (4) PCM tributaries as specified below. However,if higher PDH signals other than the 2 Mbit/s are required to be routed through, the same shall bepossible just by adding the respective interface cards and no extra wiring needed. It shall have2 Mbit/s outputs where it can directly be connected to digital telephone exchanges or teleprotectionequipment.

The jitter and wander tolerance for PDH and SDH interfaces shall conform to ITU-T

G.823 and G.825. Jitter and wander characteristics of SDH multiplex and line equipment shall conform to ITU-T G.783.

The Contractor shall submit the details of the power budget calculations stating the following (based on 0.25 dB/km optical fibre attenuation at 1550 nm):

- Transmitter Power
- Minimum receive Signal @ BER $1x10^{-10}$
- Connector Loss
- Repair Splice Loss
- Power Penalty (Chromatic dispersion and LD reflection Loss)
- Maintenance Margin (> 2dB)
- Other Loss
- System Margin

The SDH equipment to be offered shall provide the followings:

- A data communication channel to the Telecommunication Management Network, in accordance with ITU-T G.773 for the purpose of integration of the new equipment into the Telecommunication Network Management System.
- A Craft interface in accordance with ITU-T G.773 to allow a local terminal to accessthe network element.
- An engineer order–wire which shall have conference and selective calling features.
- Performance monitoring in accordance with ITU-T G.784 and G.826.
- Optical safety as per ITU-T

G.783. The alarm functions shall include but not limited to:-

- Alarms classified as critical, major, minor, and information.
- Indications of loss of incoming signal.
- Visual and audible indication of alarms.
- Test function of alarm indicators to ensure workability of alarm indicators.
- Alarm functions shall be detailed by the Contractor, e.g. if implemented inTelecommunication Network Management System.
- The offered equipment shall have sufficient capacity for speech, Ethernet data, SCADA dataetc and capable of extension to higher capacity by adding relevant modules.

9.2.4.1 Spare Parts, Tools and Test Equipment

Spares for Telecommunications shall be one module for each type of the modules supplied. Specialized tests tools and equipment for testing, configuration and maintenance of equipment shall be supplied. This shall include data tester and optical test tools e.g. an OTDR (MTS 8000) or it's Equivalent and other special tools proposed. The equipment shall be of the same type as used by the contractor for erection and commissioning. The test equipment shall be new and shallnot however be available to the contractor during erection and commissioning. All licenses required for commissioning of equipment shall be included.

The Contractor shall furnish a list of recommended spare parts for the OLTEs.

9.2.4.2 Documentation:

i. The Contractor shall provide all necessary drawings, design specifications, design details, operation and maintenance manuals. All manuals and As-Built-Drawings documents shall be supplied in three hard copies and a softcopy in PDF.
ii. Functional Design Specification (FDS)
iii. Test Specification for Factory Acceptance Test (FAT)
iv. Operator's Manual
v. Product Manuals

9.2.4.3 Training:

The Contractor shall provide 1-week training for four staff at the supplier's manufacturing premises on each Telecommunication type of equipment supplied and on site during installation works. All training costs shall be borne by Contractor expect travel to manufacturers place while accommodation which shall be borne by . The scope of each service shall be given. The training content shall be subject to approval of the project Manager.

9.2.4.4 Testing

The formal stages of testing to be performed fall into the following three categories:

- Type Tests Equipment shall pass these tests in order to be accepted for use under this Contract
- Factory Acceptance Tests (FAT) Systems shall pass these tests before they may be shipped to site. The employer shall witness FATs unless he waives this in writing. FAT preparation costs shall be borne by contractor except Air ticket and accommodation. FAT shall be carriedby two staff for 5 days.
- Site Acceptance Tests (SAT) Systems shall pass these tests before they may be put into operation and before they are Taken Over

9.2.4.5 System Acceptance

The System will be accepted by if both:

- The System and all items of equipment have successfully completed all the specified tests
- All failures, problems and reservations noted during the tests have been corrected to thesatisfaction of .
- If either of these conditions has not been complied with, then the necessary corrective actionshall be agreed between the Contractor and .

PARTICULAR TECHNICAL SPECIFICATIONSFOR HIGH VOLTAGE CABLES

TABLE OF CONTENTS

10. Particular technical specifications –33kV and 11kV Cables

10.1 General

All cables accessories and materials shall be in accordance with the latest editions (including all amendments)of IEC and ISO recommendations.

All cables shall be suitable for operation:

- on a system with direct earthing of the transformer neutral
- under maximum load (ONAF conditions) plus 10% specified for respective transformers
- in the climatic conditions prevailing at site

No joints shall be allowed. Only dry vulcanising processes shall be used. Special precautions shall be taken toavoid ingress and spreading of moisture and development of water-treeing. The Tenderers shall documents theconstruction measures used to achieve these requirements.

10.1.2 Conductors

All conductors shall be stranded copper or aluminium. The conductor shall be clean, uniform in size, shape and quality, smooth and free from scale, splits, sharp edges and other harmful defects. The conductor shall bein accordance with IEC 60228. The conductor shall be filled with swelling powder to stop axial ingress of moisture.

10.1.3 Cable

The conductor shall be covered with:

- An extruded semi-conducting layer
- A layer of dry vulcanised cross-linked polyethylene (XLPE) insulation
- An extruded strippable semi-conducting layer
- A water tight copper or aluminium seal
- A layer of swelling tape to prevent axial ingress of water along the screen
- A layer of earthing screen of stranded aluminium or copper
- An outer LDPE (low density polyethylene) sheath for water tightness and mechanical protection.

10.1.3.1 Laying-up and Fillers of Three Phase Cables

The cores of three-phase cable shall be laid-up together with suitable fillers, wormed circular and binding tapesapplied overall

10.1.3.2 Manufacturer's Identification

The manufacturer's identification shall be provided throughout the length of the cables by means of a tape under the sheath printed with the manufacturer's name and ``Property of ´´. Alternatively the identification may be embossed on the outer PVC sheet together with identification and voltage markings

10.1.3.2 Amour

All cables shall be steel wire armoured according to approved manner and international IEC/BS standards

10.1.4 Testing

Notwithstanding that cables are manufactured to the approved standards all cables, accessories and materials shall be subjected to and withstand satisfactorily the test requirements detailed in this specification. All materials shall withstand such routine tests as are customary in the manufacture of the cables and accessoriesincluded in the Contract. The manufacturer shall have established a quality control system based on regularlyaccelerated test of production samples according to CENELEC HD605. This system shall be described in theBid.

10.1.5 Sealing and drumming

The cable shall be wound on strong drums arranged to take a round spindle of a section adequate to support the loaded cable drum during installation and handling. The drums shall be lagged with closely fitting battensthat shall be securely fixed to prevent damage to the cable. Wooden drums shall be constructed of seasoned timber to prevent shrinkage of drums during shipment and subsequent storage at site. Each drum shall be clearly marked including indication of direction of rolling.

The ends of the cables shall be suitable sealed to prevent ingress of moisture. The end of the cable left projecting from the drum shall be securely protected against damage by mishandling during transport and storage.

10.1.6 Current carrying Capacity and Design Parameters

The maximum continuous current carrying capacity and maximum permissible continuous conductor temperature, and the factors for determining such rating and temperature shall be based on recommendations found in IEC 60287, subsequent amendments and all conditions prevailing on the Site

10.1.7 Terminations

Detailed drawings showing the types of cable sealing ends, terminal arrangements shall be submitted to the Project Manager for approval. Stress cones or other approved means shall be provided for grading the voltagestress on the core insulation of the cables.

The terminations for the cables shall be of an appropriate heat shrink design incorporating a suitable arrangement for stress control, and rain sheds for outdoor use.

Termination kits shall include suitable heat shrink tubing to effectively shroud, seal and insulate the exposed cable conductor and shall include a heat shrink glove to effectively seal the crutch of the cable to prevent ingress of moisture into the interstices of the cable. Suitable arrangements shall be provided to earth the cablescreens and armour

Terminations into cable boxes shall include brass compression glands and back nuts of the correct size, whichshall secure the cable outer sheath and ensure effective continuity between the cable armouring wires and the metal enclosures on which the cables are terminated. At all rising terminations the cable inner sheath shall passthrough the gland to terminate not less than 6 mm above the gland

10.1.8 Heat Shrink Materials

Heat shrinking tubing and moulded parts shall be flexible, flame retardant, Polyofin-based material of electrical insulating quality, and shall be obtained from an approved manufacturer. They shall be suitable for use indoors or outdoors in the conditions prevailing on site

The material shall reduce to predetermined size and shape when heated above 120 °C. The components shall also be provided with an internal coating of hot melt adhesive compound that shall not flow or exude at temperature below 85 °C. All parts and materials shall be tested to a program of tests to be agreed with the manufacturer.

Each part shall bear the manufacturer's mark, part number and any other necessary marking to ensure correctidentification for use on the correct size and type of cable. Each set of parts shall be packed as one unit with full and complete installation instruction and clearly marked to show the application.

10.2 Installation

This extract from 's "Medium Voltage Underground Distribution Handbook determines the minimumacceptable conditions for installation of medium voltage cables."

10.2.1 General

The cables will be laid in trenches that will be as straight as possible avoiding sharp bends.

The areas where trenches are to be excavated will be marked clearly on the ground. If the location of other servicesis known, they will be marked in order to take necessary precautions.

Before construction commences trial pits will be made in order to confirm the soil strata of the planned trenchesand to confirm the location of other services.

Safety precautions such as covering the trench, fencing and warning signs will have to be provided for during theperiod of work.

When designing the plan for the trench layout, the minimum radius will be as in the following table.

Table 10.1: Bending Radii

Bending radii	Single core	3-core
Recommended	17xD	15xD
Minimum	15xD	12xD
At sealing ends	12xD	10xD

D = cable diameter

10.2.2 Cable Marker

Cable markers shall be installed at the beginning and end of the cable run on the surface all along the route, at all changes of direction, and above all joints, above cable duct entries and exits and at an interval not exceeding 50m along the cable route. This information as well as details about the joint (i.e. joint location) will be also recorded on a map.

10.3 Excavation of Trenches

The trench will be dug vertically to a minimum depth of 600mm or more as required. All precautions must be madeso as not to cover any services e.g. fire hydrants with soil that may be encountered in the path of the trench.

During construction on public roads passage and access of motorists and pedestrians to commercial areas must bemaintained.

In order to reduce the cost of reinstatement on roads and pavements the digging shall be done at intervals of 2-3 mand a gallery or tunnel dug underneath.

If trenches are constructed in soggy or inconsistent soil, the cables will be laid inside a duct as a protective measureand precautions taken to prevent the entry of water at the ends or joints of the ducts

The bottom of the trench must be made of firm material in order to prevent collapse of the base that may subject the cable to mechanical stress.

When several cables of different voltages are laid in the same trench they will be placed at different depths. The cables of the higher voltage will be placed deepest.

Where the trench is too deep as to cause instability to the walls of the trench shoring will be placed to provide lateral support to the trench walls.

The separation between two groups of cables will be a minimum of 250mm. If this separation cannot be attained they will be laid in ducts or will be separated by a layer of bricks.

10.3.1 Joint Holes

Where cable joints are required to be made in the course of a cable run, a joint hole shall be excavated of sufficientsize to enable the cable jointer to work efficiently and unimpeded.

10.3.2 Backfilling of Trenches

Once the cable has been laid the trenches must be back filled to an adequate compaction level. Care must be takento ensure that the first layer covering the cables will be free of rocks or any sharp mechanical objects.

The back fill will be laid in layers of 150mm, which should be compressed and watered if necessary in order to make the soil sufficiently compact.

10.3.3 Pavement Reinstating

The pavement shall be reinstated back to the standard of the original pavement. New materials will generally be used in accordance with Municipal regulations.

10.3.4 Ducts

Road crossings when necessary will be done with ducts in the following manner

- they will be installed in a level position and concreted where possible to provide mechanical protectionthroughout its length, they will have a depth of 1.2m.
- future expansion will be provided for by providing one or several spare ducts depending on the locationof the crossing.
- at all times the cables should be adequately protected.
- road and railway crossings must be planned in full detail.
- drainage of the trenches must be provided for during and after construction.

In crossings with other normal underground services, a prudent distance will be maintained in view of future excavations, and when there is a possibility of service interference, as is the case of other electric cables, waste water sewers etc.

The ducts will be fabricated from PVC or concrete with a smooth interior surface and an interior diameter of not less than 2 times the diameter of the cable to be housed inside it, and in no case will this diameter be less than 150mm.

The joints of ducts will be sealed with cement, in which case the bottom of the trench must be carefully levelled after setting down a layer of fine sand or red soil in order to permit continuous joints.

The ducts will be laid in such a manner that there is no abrasion between the insulation of the cable and the surfaceof the duct.

In the cases of single core cables the cable will have to be anchored to prevent movement due to magnetic effects by concreting the ducts at the ends of the joints. This shall not apply to three core cables.

When constructing a duct a length of wire will be left inside to facilitate the fitting of cleaning elements as well asthe cables themselves.

The cleaning will consist of passing inside a cylinder in order to remove concrete that will pass through the joints and later passing a broom or a rag to remove the residue.

10.3.5 Direct Burial

For armoured cables the following criteria for burial will be met:

- the trench must have a 150mm layer of fine sand upon which the cable shall be laid to protect the cable from mechanical damage due to sharp objects. On top of the cable another 150mm of fine sand will be laid. Both layers will cover the entire width of the trench.
- the sand should be well graded
- any materials used for back filling the trench must meet the approval of the Construction Supervisorin charge.
- the cables must be buried at a depth of not less than 600mm. Exceptions could be made for rocky areas where the minimum depth cannot be attained in this case the cable will be laid in a duct.

Cables must be protected with a layer of protecting slabs, which will also indicate their presence.

For armoured cables the excavated materials without mechanically sharp objects will be adequate enough to backfillthe trench.

Cables shall not be buried in areas within the substation boundaries. Necessary cable trenches shall be preparedinstead to the satisfaction of the client's project Manager.

10.3.6 Galleries

When the number of cables justify the use they shall be laid in galleries. The cables will be fixed to the cable trays by means of brackets or clamps.
All metallic elements will be earthed with independent connectors if there are circuits of different voltages. Electric cables will not be installed where there are inflammable materials.

10.3.7 Parallel Separation

10.3.7.1 Low Voltage Cables

Medium Voltage cables may be laid parallel to Low voltage cables as long as there is always a minimum distanceof 250 mm between them. When this distance cannot be attained, a solid brick wall shall separate them or they willbe placed in ducts.

10.3.7.2 Medium Voltage Cables

The distance to be maintained in the case of parallel situations of underground Medium Voltage lines is 250mm. Ifthis distance cannot be achieved a protective brick wall will be installed between them, or one of them will be installed within ducts.

10.3.7.3 Telecommunication Cables

In the case of parallel laying of subterranean electric cables and telecommunications wires, they must be as far as possible from each other. As long as the cables both electric and telecommunications are buried, a minimum separation of 2 meters must be maintained at all times. This distance could be reduced further to 250mm between ducts.

The clearances must be in accordance with agreements between and KPTC

10.3.7.4 Water Steam etc.

In parallel layouts between power cables and buried water pipes a minimum distance of 0.5m will be maintained in a horizontal projection. If these clearances cannot be maintained the cables will be laid in ducts.

10.3.7.5 Oil Pipe Lines

The minimum distance between the cables and the oil pipelines will be 0.5 m. The cable will be protected from anygas leaks.

10.3.7.6 Sewers

In parallel layouts of electric cables with sewerage conduits, a minimum distance of 0.5 m will be maintained, thecables will be adequately protected if this distance cannot be maintained.

10.3.7.7 Fuel Storage Tanks

There will be a minimum distance of 1.20 meters between cables and fuel storage tanks, apart from providing adequate protection for the electric cables.

10.3.7.8 Foundations of Other Services

When there are structural supports for public transport, suspended telecommunication wires, street lighting, the electric cables will be laid at a distance of at least 500mm from the outer extremities of the supports or foundationsof the structures. This minimum distance shall further be increased to 1.5m if the support or foundation is subject to continuous stress towards the curb sides.

If this separation cannot be maintained a resistant mechanical safety measure must be used throughout the length of the support and its foundation, extending to a length of 500mm, on both sides of outer extremes.

10.4 Crossing of Roads and Railroad Tracks

10.4.1 Public Roads

When crossing streets and roads cables must be laid at depths of at least 1.2m. The ducts must be durable and mechanically strong, and must have a minimum diameter of 150mm in order to permit the easy passage of the cables within the tubes. Conditions specified in the Electric Power Act must be observed at all times. Spare ducts must be provided where necessary.

10.4.2 Railroad tracks

Crossing railroad tracks must be done with conduits laid perpendicular to the tracks at a minimum depth of 1.6 m.This depth must be measured from the bottom side of the track's crossbars. It is recommended that the crossing takes place at the narrower points of railroad areas. Conditions specified by municipalities and the Railroad companies shall take precedence.

10.4.3 Crossing Other Services

Any other services to be closed by the lines shall meet the recommended clearances as per IEC standards.

10.4.4 Low Voltage Cables

When medium voltage cables cross low voltage cables, a minimum distance of 250mm must be kept between them. If this cannot be achieved, medium voltage and low voltage cables must be separated by pipes, conduits, orsolid brick divisor walls.

10.4.5 Medium Voltage Cables

When crossing other medium voltage cables, the minimum distance to be observed between them is 250mm. If this distance cannot be maintained solid bricks must be laid between them.

10.4.6 Telecommunication Wires

When crossing telecommunication wires, the electric cables must be situated within conduits of appropriate mechanical resistance, maintaining a minimum distance of at least 250mm, between the outer sides.

The electric cable must be protected in PVC or concrete duct and in such a way that it guarantees that the distancebetween the cables is greater than the minimum established for parallel layouts.

The crossing must be at least 1m from a junction box for telecommunications wires and joints for electric cableswill not be installed next to crossings of telecommunications cables.

10.4.7 Water Steam etc.

There should never be a water pipe joint over the cable. A water pipe joint must be at least 2.0 m from a crossing.

10.4.8 Gas

The minimum distance in crossings with gas pipelines shall be of 250mm. The crossing shall not be made overgas pipelines joints.

10.4.9 Sewers

In crossing sewage pipes it is recommended that the electric cable should be above the sewer line where possible.

10.4.10 Fuel Depots

Electric cable crossings over fuel deposits will be avoided at all times, the electric cables must be laid borderingthe fuel tanks, maintaining a minimum distance of 1.2 metres.

10.4.11 Transporting Cable Drums

Loading and unloading from trucks or appropriate trailers will always be made through an adequate bar that passes through the centre of the cable drum.

The cable drums will always be transported upright and never on its side.

When several cable drums are transported together they must be aligned back to back and have stopping blocksto prevent movement.

The stoppers should be uniform so that they do not pierce the cable insulation. The stoppers should span the whole length of the cable drum.

An alternative to stoppers may be to have wooden pieces nailed to the platform supporting cable drums. The stoppers will be placed at the reels of the cable drums.

The cable drum must not be tied down with ropes, cables or chains. Upon off-loading the cable drum the roll must not drop down from the truck or trailer, a provisional ramp with an inclination of not more than 1/4 will instead be constructed in the case where there are no pulleys for lifting the drum. The roll can be rolled of the ramp by means of guide ropes. Sand can be placed at the bottom of the ramp to act as shock absorber and brakefor the cable drum.

When rolling the drum on the ground the rotational direction must be observed so that the cable does not comeloose.

When the drum is rolled care must be taken to ensure that the drum is not rolled on rough ground. Care must also be taken to ensure the reel is not broken because the splinters can puncture the cable.

Where possible the cable drums should not be exposed to the elements.

10.4.12 Laying of the Cable

The cable drum will be installed on the site in such a way that the cable is reeled out of the top part of the drumand is not forced when the cable is laid.

During cable laying the drum will always be supported by means of a mechanical jack and a bar of the appropriate strength.

The base of the jacks will be sufficiently large as to ensure stability during operation.

When taking off the wood stoppers care must be taken to ensure that the material used in nailing them does nodamage to the cable.

The cables must always be unrolled and laid with the greatest care to avoid torsion or kinks and alwaysmaintaining the correct bending radius of the cables.

When the cables are being laid the workers must be distributed uniformly along the trench.The cables should also be laid using cable rollers.

10.4.13 Mechanical Protection

Underground electric lines must be protected against possible breakdowns caused by landslides, contact with hard bodies, and clashing of metal tools. For this purpose, a protective layer of Hatari slabs of class 15 concretewill be placed.

10.3.14 Warning Signs

All cables must have a protection slab placed over the cables buried at least 200 mm above the cable layer. When the cables or groups of cables of different voltages are placed in vertical layers the protection slab must be placed over each layer.

10.3.15 Identification

The cables must bear marks indicating the year of manufacture, manufacturer's name, and cable characteristics(size and voltage level).

GUARANTEED TECHNICAL PARTICULARS

FOR

MAJOR MATERIALS AND EQUIMENT

11. GUARANTEED TECHNICAL PARTICULARS

11.1 Preamble

11.1.1 The Guaranteed Technical Schedules MUST be filled in, signed and stamped by theManufacturer and submitted with the Biddingdocument. Type test reports and certificate of accreditation for the testing body/Laboratory MUST be provided for evaluation. Also all relevant manufacturer'stechnical documents MUST be provided for reference to support the guaranteed values.

11.1.2 Bidder shall offer only one type of equipment for each equipment required in the contract, and from one manufacturer only. No more than one equipment of each typerequired shall be offered, and from different manufacturers. Where the bidder offers more than one equipment/item of each type from different manufacturers contrary to this clause, the employer shall choose only one of the equipment for evaluation. Allother equipment shall not be considered

11.1.3 Where parameters/Values of equipment in the attachment for equipment specifications differ with those required in the guaranteed technical schedules (GTPs), the guaranteed technical schedules parameters shall prevail.

11.1.4 Parameters required in the Guaranteed Technical Schedule shall prevail over those in the annexes of attached equipment technical specifications.

11.1.4 Only the guaranteed technical schedules provided herein/below shall be filled (**Do not fill technical guarantees in the Annexes of attached equipment technical specifications**).

11.1.5 All data entered in the Guaranteed Technical Schedules are guaranteed values by the Bidder/manufacturer and cannot be departed from whatsoever.

SCHEDULE 1: GUARANTEED TECHNICAL PARTICULAR - PHASE CONDUCTOR(150mm^2 ACSR)

GURANTEES FOR 150mm^2 PHASE CONDUCTOR				
Item	**Particulars**	**Unit**	**Guarantee dValue**	**Ref. doc.**
1	**Phase Stranded conductor**			
	Manufacturer and Country of manufacture			
	Year of service outside the country of manufacture (5 years Minimum)	Years		
	Manufacturing experience (10 years minimum)	Years		
	Type of Conductor			
	Code Name			
	Reference IEC/BS Standards			
	Type test reports			
	Aluminium wire	Nos/mm		
	Steel wire	Nos/mm		
	Overall diameter	mm		
	Cross-section of Aluminium area	mm^2		
	Cross-section of Steel area	mm^2		
	Weight per km	kg		
	Calculated Breaking load	KN		
	Maximum resistance at 30^o C per km	Ohm		
	Modulus of Elasticity	kg/ mm^2		
	Conductor lay	state		
	Minimum weight of grease	Kg/km		
	Length of conductor per drum	m		
	Approximate net weight per drum	kg		
	Approximate gross weight per drum	kg		
	Dimension of drum (diameter x thickness)	mm x mm		
2	**Individual wires before stranding**			
	Tolerance of diameter of Aluminium wire	%		
	Tolerance of diameter of Steel wire	%		
	Minimum tensile strength of Al. wire	kg/mm^2		
	Minimum tensile strength of Steel wire	kg/mm^2		
	Conductivity	%		
	Minimum twisting number of steel wire: -100 x diameter (length)	Nos.		
	Galvanising: - Min. coating weight of Zinc	grams/m^2		

SCHEDULE 2: GUARANTEED TECHNICAL PARTICULARS - OUTDOOR CIRCUITBREAKERS (11 AND 33 KV)

GURANTEES FOR OUTDOOR VACUUM CIRCUIT BREAKERS			Guarat. Value		Refer .doc
Item	**Particulars**	**Unit**	**11kV**	**33kV**	
1	Circuit Breakers Type (Model)	-			
2	Manufacturer and Country	-			
3	Reference IEC/BS Standards	-			
4	Year of service outside the country of manufacturer (5 years minimum)	Years			
	Manufacturing experience (10 years minimum)	Years			
5	Type test reports	-			
6	Arc quenching Medium	-			
7	Pole design operation (ganged)	-			
8	Tank design type	-			
9	Highest rated voltage	kV			
10	Nominal rated Voltage	kV			
11	Rated frequency	Hz			
12	Rated continuous current at 50◦C for 33kV CB For 11kV transformer incomer/ feed outs the current at 50◦C	A			
13	Lightning Impulse withstand voltage 1.2/50μs for 33kV Circuit breaker For 11kV transformer incomer/feeder outs	kVpeak			
14	One minute power frequency withstand voltage, dry and wet for 33kV Circuit Breaker For 11kV transformer incomer/feeder outs	kVrms			
15	Rated short-time (short circuit) current/3sec.	kArms			
	Rated short circuit making current	kApeak			
16	Maximum contact resistance of Main Contact	Ohms			
17	Rated operation Sequence				
18	Rated Current Breaking capacity	kApeak			
19	Bushing type	-			
20	First pole to clear factor	-			
21	Minimum creepage distance of insulator	mm			
22	Minimum clearance between phases	mm			
23	Minimum clearance to earth	mm			
24	Opening time				
25	Closing time				
26	Operating mechanism type				
27	Rated control voltage Tripping/Closing coil	Vdc			
28	Spring charging motor/Control voltage	Vdc			

29	Main contact material				
30	Charging spring status indication				
31	Terminal connector material (Tinned Bi-metallic)				
32	Number of Auxiliary contacts (NO and NC)	No			
33	Minimum Operations permissible before maintenance	No			
34	Manual ON and OFF operation Switch				
35	Anti-Pumping device				
36	Auxiliary supply (Single phase)				
37	Circuit Breaker Position Indication				
38	Heaters and Hygrometer				
39	Mechanical Trip/Close device				
40	Control cubicle IP Class				
41	Control cubicle powder coating colour shade				

SCHEDULE 3: GUARANTEED TECHNICAL PARTICULAR-
DISCONNECTOR/ ISOLATORS(33 AND 11 KV)

33 AND 11KV DISCONNECTOR WITH & WITHOUT EARTH/SWITCH					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer .doc.**
			11kV	**33kV**	
1	Disconnector type/Model				
2	Manufacturer				
3	Disconnector design type (Double side break with rotating centre post)				
4	Reference Standards				
5	Type test report				
6	Manufacturing experience (10 years Minimum)	Years			
7	Years of service outside country of manufacture (5 years minimum)	Years			
8	Rated Voltage	kV			
9	Nominal voltage	KV			
10	Lightening impulse withstand voltage 1.2/50ms				
	Contacts Closed	kV peak			
	Contacts Open	kV peak			
11	Rated Power frequency withstand voltage (Wet and dry)				
	Contacts Closed	kVrms			
	Contacts Open	kVrms			
12	Rated frequency	50 Hz			
14	Rated continuous current	Amps			
15	Rated short circuit withstand current / 3 seconds	KA/3Sec			
17	Short circuit making capacity	kA			
18	Minimum creepage distance of Insulators	mm			
19	Mechanical endurance (Min. Open–Close)	Cycle			
20	Maximum open and Closing time	Seconds			
21	Drive mechanism motor protection	-			
22	Contact resistance of Main contacts	Micro-ohm			
23	Main contact material	(Tinplated copper)			
24	Thickness of Silver/Tin coating	Microns			
25	Isolator Mechanical Handle				
26	Electrical and Mechanical operations				
27	Motor Control Voltage	VDC			
28	Auxiliary supply (Single phase)	Vac			
29	Integral earths Switch where required				

33 AND 11KV DISCONNECTOR WITH & WITHOUT EARTH/SWITCH					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer .doc.**
			11kV	**33kV**	
30	Earth switch Mechanical and electrical operation				
31	Earth switch mechanical handle				
32	Isolator and Earth switch mechanical interlock (Available /not available)				
	Isolator and Earth switch Electrical interlocks (Available/not Provided)				
33	Minimum no. of spare Auxiliary NO and NC contacts	Nos			
34	Control box IP degree of protection				
35	Padlocking facility required				
36	Thickness zinc galvanization of ferrous parts				
37	Earthing points				
39	Insulator material (Brown glazed porcelain)				

SCHEDULE 4: GUARANTEED TECHNICAL PARTICULAR - OUTDOOR CURRENT TRANSFORMERS (33 AND 11KV)

33 AND 11KV CURRENT TRANSFORMER					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer. doc.**
			33KV	**11KV**	
1	Current transformer type (Oil-hermetically sealed)	-			
2	Manufacturer and Country				
	Manufacturing experience (10 years minimum)	Years			
3	Years of service outside country of manufacture(5 years minimum)	Years			
4	Type test reports				
5	Reference IEC/BS standards				
6	Rated Highest voltage	kV			
7	Nominal Voltage	kV			
8	Current transformer tank design type (Dead tank)				
9	Rated frequency	Hz			
10	One-minute Power frequency voltage withstand				
a	Primary winding	kVrms			
b	Secondary winding Insulation level	kVrms			
11	Lightning impulse withstand voltage 1.2/50µms	kVpeak			
12	Rated currents ratios (12kV) Rated Current ratios (33kV)	A			
13	Rated secondary current	A			
14	CTs Core, Class and Burden	Core 1 Core 2 Core 3 Core 4			
15	Short circuit withstand current for 3seconds	kA peak			
16	Safety factor				
	Instrument security factor				
17	Number of cores	No			
18	Primary and Secondary winding material				
19	Primary terminal				
20	Bushing type				
21	Minimum creepage distance of insulator	mm			
22	Secondary and Primary Earthing points				
23	IP Class of terminal box				
24	Marking/Labelling				

SCHEDULE 5: GUARANTEED TECHNICAL PARTICULARS - OUTDOOR VOLTAGETRANSFORMERS

GURANTEES FOR 33 AND 11KV VOLTAGE TRANSFORMER					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer. doc.**
			33KV	**11KV**	
1	Voltage transformer type				
2	Manufacturer and Country				
	Manufacturing experience (10 years minimum)	Years			
3	Years of service outside country of manufacture (5 years minimum)	Years			
4	Type test reports				
5	Reference IEC/BS standards				
6	Rated Highest voltage	kV			
7	Nominal Voltage	kV			
8	Voltage transformer Tank design type				
9	Rated frequency	Hz			
10	One-minute Power frequency Voltage withstand				
a	Primary winding	kVrms			
b	Secondary winding Insulation level (minimum 2.5kV)	kVrms			
11	Lightning impulse withstand voltage 1.2/50μs	kV_{peak}			
12	Short circuit withstand current for 3 Seconds	k_{peak}			
13	Burden and accuracy class				
a	Protection winding Class, Burden at 0.8Pf lagging				
b	Measuring winding Class and Burden at 0.8Pf lagging				
c	Voltage Ratio (Primary/Secondary)				
14	Maximum Temperature rise (Winding/Oil)				
15	Rated Voltage factor				
16	Permissible partial discharge (PD) :PD test Voltage (r.m.s) = Um/√3 PD test Voltage (r.m.s) = 1.2Um√3				
17	Primary and secondary winding material				
18	Primary terminal				
19	Bushing type (Brown glazed porcelain)				
20	Minimum creepage distance	mm			
21	Secondary and Primary Earthing Point				
22	IP Class of terminal box				
23	Markings/Labelling				

SCHEDULE 6A: GUARANTEED TECHNICAL PARTICULARS - 33 AND 11KV COMPOSITEINSULATORS (TENSION AND SUSPENSION)

GUARANTEES FOR 33 AND 11 KV COMPOSITE INSULATORS							
Item	**Particulars Specifications**	**Unit**	**Guaranteed Value**				**Refer Doc.**
			Suspension		**Tension**		
			33KV	**11KV**	**33KV**	**11KV**	
1.	Insulator type (Polymeric)						
2.	Design type						
3.	Manufacturer and Country						
4.	Reference IEC/BS Standards						
5.	Manufacturing experience (10 years minimum)	years					
6.	Year of service outside the country of manufacture (5 years minimum)	year					
7.	Type test reports	provide					
8.	Rated Highest Voltage (kV)	kV					
9.	Nominal Voltage	kV					
10.	Minimum failing Load	KN					
11.	Pollution Category						
12.	Dielectric material						
13.	One-minute power frequency withstand voltage, 50Hz, wet and dry	kV_{rms}					
14.	Lighting impulse withstand voltage, 1.2/50µs	kV_{peak}					
15.	Minimum creepage distance	mm					
16.	Insulator Housing characteristics						
	One-minute power frequency withstand voltage, 50 Hz, wet and dry	kV_{rms}					
	Lighting impulse withstand voltage, 1.2/50µs	kV_{peak}					
17.	Short circuit withstand current/3sec	kA					
18.	Housing shield resistance	kΩ					
19.	Permissible head load (Static)	N					
	Permissible head load (dynamic)	N					
20.	Specified mechanical load, tension (minimum)	KN					
21.	Material of fittings						
22.	Material of housing and sheds (HTV silicon)						
23.	Minimum distance between sheds						
24.	Zinc coating thickness of ferrous parts						
25.	Colour of final insulator housing						
26.	Minimum sheath thickness of Silicon						
27.	Mounting brackets						

SCHEDULE 6B: GUARANTEED TECHNICAL PARTICULARS FOR COMPOSITE 33/11KVPOST INSULATORS (VERTIVAL AND HORIZONTAL)

33 AND 11KV COMPOSITE POST INSULATORS							
Item	**Particulars Specifications**	**Unit**	**Guaranteed Value**				**Refer Doc.**
			Suspension		**Tension**		
			33KV	**11KV**	**33KV**	**11KV**	
1.	Insulator Type (Polymeric)						
2.	Design type						
3.	Manufacturer and Country						
4.	Reference IEC/BS Standards						
5.	Manufacturing experience (10 years minimum)	Years					
6.	Year of service outside the country of manufacture (5 years minimum)	Year					
7.	Type test reports	Provide					
8.	Rated Highest Voltage (kV)	kV					
9.	Nominal Voltage	kV					
10.	Minimum failing Load	KN					
11.	Pollution Category						
12.	Dielectric material(Silicon rubber)						
13.	One-minute power frequency withstand voltage, 50 Hz, wet and dry	kV_{rms}					
14.	Lighting impulse withstand voltage, 1.2/50µs	kV_{peak}					
15.	Minimum creepage distance	mm					
16.	Nominal total height	mm					
17.	Short circuit withstand current/3sec	KA					
18.	Housing shield resistance	KΩ					
19.	Shed spacing –projection ratio						
	Minimum distance between sheds	mm					
20.	Creepage clearance ratio						
21.	Specified mechanical load, tension (Minimum)	kN					
22.	Material of fittings						
23.	Minimum sheath thickness	mm					
24.	Material of housing and sheds (HTV silicon)						
25.	Minimum distance between sheds						
26.	Zinc coating thickness on ferrous parts						
27.	Colour of final insulator housing						
28.	Minimum sheath thickness of Silicon						
29.	Number of units	no					
30.	Mounting brackets						

SCHEDULE 7: GUARANTEED TECHNICAL PARTICULARS - 33 AND 11KV SURGEARRESTORS

11 AND 33KV SURGE ARRESTORS					
Item	**Particulars**	**Unit**	**Guarant. Value**		**Refere nce doc**
			11KV	**33KV**	
1	Surge arrestor type (Metal Oxide (MOV) Gapless				
2	Manufacturer and country of origin				
3	Surge arrestor housing (Silicon rubber/Polymeric)				
4	Reference IEC/BS Standards				
5	Type test reports	provide			
	Manufacturers experience (10 years minimum)	Years			
6	Minimum years of service outside country of manufacture (5 years)	Years			
7	Surge Arrestor housing capability				
a	Highest system Voltage (Um, KV)	kV			
b	System Lightning Impulse withstand voltage 1.2/50µs	kV peak			
c	One minute System power frequency withstand Voltage, dry and wet	kV rms			
d	Short circuit current withstand	kA/3Sec.			
e	Housing shield resistance	kΩ			
f	Creepage distance	mm			
8	Distribution and Discharge class	kA/Class			
9	Earth fault factor as IEC 60099-4				
10	Rated frequency	Hz			
11	Rated Voltage (Ur, KV)	kV			
12	Max, continuous operating Voltage	kVrms			
13	Short circuit withstand current Asymmetrical peak	kA			
14	Nominal discharge current	kA			
15	Maximum duration of Earth fault as per IEC 60099-4 (minimum 3 seconds)	Sec			
16	Long duration discharge class	A/µS			
17	Partial discharge	pC			
18	Energy discharge capability at Ur	KJ/KV			
19	Temporary Over voltage with stand for 1Sec.	kV rms			
20	Temporary Overvoltage withstand for 10 Sec.	kV rms			
21	Maximum residual Voltage at steep lightning and Switching impulse currents at;				
a	10kA (1/2µS)				
	40kA (80/20µS)				
b	500kA (30/70µS)				
	2kA (30/70µS)				

22	Max. Lightning Impulse protection Level	kVpeak			

	Steep current impulse protection level	kVpeak			
23	One minute power frequency withstand voltage protection, level max	kVrms			
24	Operation counter				
25	Leakage current meter/Indicator				
26	Mounting base type				
27	Number of units per complete insulator	no			

SCHEDULE 8: GUARANTEED TECHNICAL PARTICULARS - 110 AND 48VDC BATTERIES

48 AND 110VDC VENTED NICKEL CADMIUM BATTERIES					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer doc.**
			110V/265Ah	**48V/ 165Ah**	
1	Battery type (Vented nickel- cadmium rechargeablecells (K), as per IEC 60623				
2	Manufacturer and Country				
3	Reference IEC/BS Standards				
	Manufacturing experience (10 years minimum)	Years			
4	Year of service outside the country of manufacture(5 years minimum)	Years			
5	Type test reports				
6	Ambient operating temperature	°C			
7	Maximum operating temperature	°C			
8	Rated Capacity at C_5 (5 hour rate) at 20°C				
9	Discharge end voltage per cell at 20±5°C	V			
10	Battery unit design (one or Two cells per unit)				
11	Minimum number of cells per bank (92/40)	no			
12	Cell container (High grade translucent methacrylatebutadiene styrene) as per IEC 60622)				
13	Container shape (prismatic /rectangular)				
14	Cell rated Voltage (IEC 60623 at 20±5°C)				
	Nominal Voltage	V			
	Float voltage	V			
	Boost voltage	V			
15	Design life span (minimum)	years			
16	Nominal charging current at 20 °C (Maximum)	A			
17	Nominal Charging voltage 20 °C				
18	Charge coefficient				
19	Internal Resistance				
20	Charge efficiency (minimum)	%			
21	Operating temperature range				
	a) Discharge				
	b) Charge				
	c) Storage				
22	Charging Current at 40°C				
	265Ah battery (Maintenance /Boost)	A			
	165Ah battery (Maintenance /Boost)	A			
23	Positive plate material (Nickel hydroxide)				

24	Negative plate material (Cadmium hydroxide)				
	Terminal marking (+VE and –VE)				
25	Separator material (Layers of Polypropylene)				
26	Terminal Material (Nickel plated steel				
27	Electrolyte (Battery grade Potassium hydrochloride (Asper IEC 60993)				
28	Reserve electrolyte per cell				
29	Anti-Splash Venting device with Flame arrestor, plugs and Clip cover				
30	Inter cell connection plates (Silver plated copper)				
31	Battery rack epoxy anti-acid coating				
32	Battery rack material (Phosphatized steel)				
33	Temperature monitoring device				
34	Technical data labelling on each battery				
35	Venting device				

SCHEDULE 9: GUARANTEED TECHNICAL PARTICULARS – 110V AND 48V BATTERYCHARGERS

110V AND 48V BATTERY CHARGERS					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer. Doc.**
			110VDC	**48VDC**	
1	Charger type/ Model				
2	Manufacturer and Country				
3	Reference IEC/BS Standards				
4	Year of service outside the country of manufacture (5 years)	Years			
	Manufacturer's experience (10 years minimum)	Years			
5	Type test report				
6	Service condition				
7	Ambient operating temperature	°C			
8	Maximum operating temperature	°C			
9	Design type (Floor standing)				
10	Input Voltage 3phase (415V±10%) at 50Hz±5%	Vac			
11	48Vdc Charger output (Charging Voltage)				
	Nominal Voltage	V			
	Float Voltage Range	V			
	Boost Voltage	V			
12	48Vdc charger output current				
	Rated output current	A			
	Trickle current	A			
	Boast current	A			
13	110Vdc Charger output (Charging Voltage)				
	Nominal Voltage	V			
	Float Voltage Range	V			
	Boost Voltage	V			
14	110VDC charger output current				
	Rated output current	A			
	Trickle current	A			
	Boast current	A			
16	Output Voltage Regulation (RMS) for the chargers				
	Float mode (+/- 1%)				
	Boost mode (+1% - 4%)				
	Full load and within the input supply limits (0- 100%)				
	Battery capacity (7%)				
17	Cooling (natural air convection)				
18	Operating temperature (-1 to 40°C)				
19	Fault Protection (Earth and Short circuit)				
20	Reverse polarity protection				
21	Automatic current-limiting into load fault condition				
22	Current limiting protection to 100% full load				
23	Flush mounted measuring instruments (Digital/ Analogue/LCD)				
24	Controls for the chargers				

	AC On/Off mains input MCB				
	Manual float/boost selection switch				
	Ammeter and Voltmeter selector switch				
	Alarm cancellation/Reset push button				
25	Load supplies: At least 4 pairs protected with MCBs				
26	LED indications to display in front panel				
	Charger failure (output failure)				
	Mains supply failure				
	Indications for each phase supply				
	Boost charge On and failure				
	Float charge On and failure				
	Battery temperature cut off alarm				
	Battery Under and Over voltage				
	Positive and negative earth fault				
	a) Over current cut off Alarm				
	b) Main load MCB trip				
27	Audible Alarm annunciator for charge failure				
28	Bus bar material Copper/silver plated copper				
29	Auto change over from float to Boost charge				
30	Constant current Charging method				
31	Alarm repeat relay for remote communication				
32	Paint and shade (Powder coated, admiral Grey color shade no. 632 of BS381C				

SCHEDULE 10: GUARANTEED TECHNICAL PARTICULARS–33/11KV CONCRETE POLES

33 AND 11KV CONCRETE POLES					
Item	**Particulars**		**Employer's requirement**	**Guaranteed Value**	**Refer doc.**
1	Name and Address of the Manufacturer		State		
	Minimum years of manufacturing (5 years minimum)		State		
	Minimum years of poles service in Kenya (3 years minimum)		State		
	Model of the offered poles		State		
	Manufacturer's warranty and guarantee		Provide		
2	Sizes of the Poles Offered		State		
3	Reference Design Standard of manufacture		State		
4	Reference testing Standard		State		
5	Type of pole offered	Reinforced	State		
		Pre-stressed	State		
6	**Minimum poles requirement**				
a	Design Strength		State		
b	Quality of finish		State		
c	Admixture		State		
d	Mode of compaction		State		
e	Finished pole free from honeycombing		State		
7	Earthing (Conductor material size)		State		
8	Provision of Earthing Ferrules		State		
9	**Size and strength Class of poles**				
a	Pole taper		State		
b	Safety Factor		State		
c	Color of finished poles		State		
d	Manufacturing Capacity (units per month)		state		
e	Type Test Reports		provide		
f	Type test Certificate from KBES as per ISO/IEC 17025		provide		
g	Acceptance tests to be witnessed by Engineers		list		

SCHEDULE 11: GUARANTEED TECHNICAL PARTICULARS - 185mm² THREE CORE 11KVXLPE ALUMINIUM CABLES

11KV 185mm² AL THREE CORE CABLE					
Item	**Particulars**		**Unit**	**Guaranteed Value**	**Ref. doc**
1.	Manufacturer and country of origin				
2.	Minimum manufacturing experience (10 years minimum)		Years		
3.	Years of service outside country of manufacture (5 years minimum)		Years		
4.	Service Condition				
5.	Applicable IEC/BS standard(s)				
6.	Rated Continuous operating temperature		°C		
7.	Short with withstand temperature for 5Secs.		°C		
8.	Conductor material				
9.	Minimum insulation thickness and resistivity at 90°C		mm/Ω		
10.	Insulation	Material (XLPE)			
		Minimum Thickness	mm		
		Screen tape around the conductor			
11.	Water barriers				
12.	Metallic Screen	Type and material			
		Min. Tape/Wires screen area			
		Thickness of separation layer	mm		
		Short time current of tape/Wire screen for 3sec at 90 - 200 °C	kA/3Sec		
13.	Extruded PVC Over sheath	Withstand power frequency at 90 °C for 1sec	kVrms		
		Over sheath min. thickness	mm		
		Anti-termite protection			
		Fire resistance			
		Marking			
14.	Wire Armour	Material of armour wire and tape			
		Nominal armour wire diameter	mm		
15.	**Ratings and Characteristics**				
	Conductor nominal cross-sectional area		Sqr mm		
	Voltage rating Uo/U(Um)		kV		
	Conductor shape				
	Maximum conductor DC resistance at 20°C		Ω/km		
	Maximum conductor AC resistance at 90°C		Ω/km		
	Minimum conductor diameter		mm		
16.	Current capacity	Buried underground	A		
		In air (trench)	A		
17.	Power frequency withstand test voltage for 5min		kVrms		
18.	Short Circuit rating of conductor for 3sec at (90-250 °C)		kA/3Sec		
19.	Maximum Capacitance/km		μF/km		
20.	Impedance @50Hz@90 °C		Ω/km		
21.	Reactance /km@50Hz		Ω/km		
22.	Inductance/km		mH/km		
23.	Maximum charging current/km		A/km		
24.	Impulse withstand voltage as per IEC60230		kVpk		
25.	Minimum bending radius(Static)		mm		
26.	Weight per Km (kg/km)		Kg/km		

SCHEDULE 12: GUARANTEED TECHNICAL PARTICULARS - POWER TRANSFORMERS

GUARANTEES FOR 2.5MVA 33/11KV POWER TRANSFORMER				
Item	**Description**	**Unit**	**Guaranteed Value**	**Refer. Doc.**
1.	Power transformer Make/Model			
2.	Manufacturer and Country			
3.	Minimum Manufacturing experience (13 years)	Years		
4.	Minimum years of service outside country of origin (7 years)	Years		
5.	Type test certificate from accredited body	Provide		
6.	Type test reports and testing Lab accreditation certificate	Provide		
7.	Reference IEC/BS standards	Provide		
8.	Transformer nominal capacity	MVA		
9.	Rated voltage	kV		
10.	Rated Frequency	Hz		
11.	Vector Group as per region			
12.	Nominal Voltage	kV		
13.	One-minute Power frequency Voltage withstand, 50Hz, 60 sec, wet			
	Primary winding Insulation level	kVrms		
	Secondary winding Insulation level	kVrms		
14.	Lightning impulse withstand voltage 1.2/50µs, dry +Ve	kVpeak		
	Primary winding			
	Secondary winding			
15.	Continuous maximum rating current on Nominal and extreme tapping at ambient conditions	A		
16.	Capacity during ONAN Cooling (Minimum)	MVA		
17.	Rated no-load voltage at rated frequency on			
18.	HV, principal tapping	kV		
	HV, Highest tapping	kV		
	HV, Lowest tapping	kV		
	LV winding	kV		
19.	Tapping ranges from principal tapping			
	HV no of plus tappings	No		
	HV no of minus tappings	No		
	Neutral positions			
	HV steps in % of rated voltage (± 8 x 1.67)			
20.	No-load losses at			
	90 % rated voltage and frequency	kW		
	100% rated voltage and frequency	kW		
	110% rated voltage and frequency	kW		
21.	No-load current at rated voltage and frequency	A		
22.	Total No load loss (Core +Stray loss) at rated current at 75° C (%)	kw		
23.	Total losses at 75°C on principal tapping at unity power factor and rated currents (ONAN)	Kw		
24.	Impedance at rated current and frequency at 75° C			

GUARANTEES FOR 2.5MVA 33/11KV POWER TRANSFORMER				
Item	**Description**	**Unit**	**Guaranteed Value**	**Refer. Doc.**
	Positive sequence at nominal tap	%		
	Positive sequence at Max. Voltage tap	%		
	Positive sequence at Min. Voltage tap	%		
25.	Maximum temperature rise after continuous operation at rated MVA			
	Top oil (by thermometer)	°C		
	Windings (by resistance)	°C		
26.	Efficiency at 75°C on principal tapping, at unity power factor and at 0.8 pf lagging			
	120% full load	%		
	100% full load	%		
	75% full load	%		
	50% full load			
27.	Regulation at full load at 75°C on principal tapping			
	At unity power factor:	%		
	At 0.8 power factor Lagging	%		
28.	HV, LV and Neutral windings insulation type			
29.	Method of system earthing:			
	HV system			
	LV system			
30.	Maximum working flux density at rated voltage on principal tapping and rated frequency:	T		
31.	Core design type			
32.	Grade of laminated and maximum thickness	mm		
33.	Magnetising current at nominal voltage at principal tapping	A		
34.	Maximum hot spot temperature of winding	°C		
35.	Equivalent resistance referred to HV side	ohms		
36.	Equivalent reactance referred to HV side	ohms		
37.	Maximum current carrying capacity of bushings			
	HV bushings	A		
	LV bushings	A		
38.	Maximum noise level			
	Transformer and tap changing equipment energised and at no-load with ONAN cooling	dB		
39.	Number of core legs	-		
40.	Type of windings:			
	HV	-		
	LV	-		
41.	Winding conductor material			
	HV Winding	Copper		
	LV Winding	Copper		
	Neutral Winding	Copper		
42.	Bushings material			
	HV	-		

GUARANTEES FOR 2.5MVA 33/11KV POWER TRANSFORMER				
Item	**Description**	**Unit**	**Guaranteed Value**	**Refer. Doc.**
	LV	-		
	Neutral	-		
43.	Principal bushing insulator materials			
	HV	-		
	LV	-		
	Neutral	-		
44.	Total creepage distance over porcelain			
	HV bushing	mm		
	LV bushing	mm		
45.	Thickness of transformer tank			
	Sides	mm		
	Bottom	mm		
	Top	mm		
46.	Thickness of tank paint coating	mm		
47.	Type of Gasket material and Manufacturer			
48.	Transformer color coating (Admiral grey)	shade no.		
49.	Thickness of radiator plates	mm		
50.	Thickness of radiator hot dip zinc galvanizing coat	micro		
51.	Number of radiators	No		
52.	Total weight of the transformer with and without oil	Kg		
53.	Inspection Manholes and sizes	No/mm		
54.	**On-load tap changer**			
55.	Model and manufacturer			
56	Type Vacuum (In-tank)	state		
57	Total number of tappings including principal	17		
58	Rated currents of			
	Selector switch	A		
	Diverter switch	A		
	Resistors	A		
59	Driving motor power consumption	kW		
60	Driving motor (3-phase, 415Vac/50hz)			
61	Control cabinets with heaters			
62	Voltage regulating relay supply	Vdc /Vac		
63	Motor drive unit Control Voltage (230Vac/50Hz)	1phase		
64	Paralleling circuit wired, Master–Follower Mode of operation			
65	RTCC Panel complete wired with AVR relay			
66	Overall dimensions of transformer			
	Length	mm		
	Width	mm		
	Height	mm		
67	Winding, and top oil indicators	-		

GUARANTEES FOR 2.5MVA 33/11KV POWER TRANSFORMER				
Item	**Description**	**Unit**	**Guaranteed Value**	**Refer. Doc.**
68	Pressure relief device	-		
69	Silica gel breathers			
70	Buchholz relays	-		
71	Alarms and trip to be provided including;			
	Tap changer not operating, alarm	-		
	Tap changers out of step, alarm	-		
	Voltage transformer failure	-		
	Oil/gas flow transformer, alarm	-		
	Oil/gas flow transformer, trip	-		
	On load tap changer protective relay trip			
	Oil gauge low level, alarm	-		
	Oil gauge low level, trip	-		
	Tap changer oil gauge level low, alarm	-		
	Tap changer oil gauge level critical, trip	-		
	Top oil temp. high, alarm	-		
	Top oil temp. critical, trip	-		
	Winding temp. high, alarm	-		
	Winding temp. critical, trip	-		
72	Temperature indicators required:			
	HV and LV winding	-		
73	Oil level gauges required:			
	Main conservator tank	-		
	On-load tap changer conservator tank	-		
74	Bushing CTS Cores, Ratio, Burden and Accuracy class	State		

SCHEDULE 13: GUARANTEED TECHNICAL PARTICULTARS - DISTRIBUTION TRANSFORMERS

GUARANTEES FOR DISTRIBUTION TRANSFORMERS 100 - 630MVA, 33/0.42KV & 11/0.42KV					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer. Doc.**
			11/0.42kV	**33/0.42kV**	
1	Transformer Make/Model				
2	Manufacturer and Country				
3	Minimum years of service outside country of origin (7 years minimum)	Years			
	Minimum manufacturing experience (13 years minimum)	Years			
4	Type test reports				
	Type test certificate from accredited body				
5	Reference IEC/BS standards				
6	Transformer capacity	MVA			
	Highest rated voltage (HV/LV) 36/11 or 12/1.1	kV			
7	Rated Frequency	Hz			
8	Vector Group (Dyn11)				
9	Nominal Voltage (HV/LV)	kV			
10	One-minute Power frequency Voltage withstand				
	Primary winding HV (33&11kV)	kVrms			
	Secondary winding (0.42)	kVrms			
11	Lightning impulse withstand voltage 1.2/50µs - Primary winding (33/11kV)	kVpeak			
12	Continuous maximum rating on any tapping when operation under the ambient conditions	KVA			
13	Off- load tap changer				
14	Rated Off-load voltage at rated frequency on				
	HV, principal tapping	kV			
	HV, extreme plus tapping	kV			
	HV, extreme minus tapping	kV			
15	Tapping ranges from principal tapping:				
	HV no of plus tappings	No			
	HV no of minus tappings	No			
	Total tap positions (5)	No			
16	HV steps in % of rated voltage (± 2 x 2.5%)	%			
17	No-load losses at 75° C	kw			
18	Load losses at 75° C				
	50 % loading, rated voltage and frequency	kW			
	75% loading, rated voltage and frequency	kW			
	100% loading, rated voltage and frequency	kW			
	125% Loading, rated voltage and frequency	kW			
19	No-load current at rated voltage and frequency	A			
20	Total No load loss (Core +Stray loss) at rated current at 75° C (%)	kw			

GUARANTEES FOR DISTRIBUTION TRANSFORMERS 100 - 630MVA, 33/0.42KV & 11/0.42KV					
Item	**Particulars**	**Unit**	**Guaranteed Value**		**Refer. Doc.**
			11/0.42kV	**33/0.42kV**	
21	Total load losses at 75°C at rated currents	KW			
22	Impedance voltages at rated current, Unity power factor and frequency at 75° C at nominal tap	%			
23	Service condition (Altitude/temperature and Humidity				
24	Max temperature rise at				
	i) Top oil	°C			
	ii) Winding	°C			
25	Efficiency at 75°C on principal tap, at unity power factor and at 0.8 power factor lagging;				
	120% full load	%			
	100% full load	%			
26	HV and LV windings insulation type				
27	Maximum working flux density at rated voltage on principal tapping and rated frequency:	Tesla			
28	Core design type				
29	Grade of laminated CRGO and manufacturer				
30	Thickness of single lamination (Maximum)	mm			
31	Maximum current carrying capacity of bushings				
	HV bushings	A			
	LV bushings	A			
32	Winding conductor material				
	HV Winding	Copper			
	LV Winding	Copper			
33	Bushings material HV and LV				
34	Total creepage distance over porcelain (minimum)				
	HV bushing (33/11kV)	mm			
	LV bushing	mm			
35	Thickness of transformer tank (minimum)				
a	Corrugated sides	3.15mm			
b	Bottom	5.0mm			
c	Top	mm			
38	Thickness of tank paint coating (minimum)	micron			
39	Finished transformer color (Admiral grey)	Shade no.			
40	Following devices shall be installed				
	Pressure relief				
	Oil level indicator visible from ground				
	Non-standard Nuts/Bolts on top cover				
	Lifting lugs and Arcing horns				
41	Sound level at 100% Load				

SCHEDULE 14: GUARANTEED TECHNICAL PARTICULARS - PROTECTION IEDS(RELAYS)

SCHEDULE 14A: GUARANTEES FOR DISTANCE PROTECTION RELAY				
item	**Particular**	**Employer's requirements**	**Quar. Value**	**Refer. Doc**
1.	Manufacturer's Name and Country	State		
	Type or designation name of Relay	state		
	Minimum Manufacturing experience of 10 years	state		
	Minimum of 5 years in service outside country of manufacture	state		
	Ratings: Ac Inputs: 1-5Amp	State		
	Power Supply Voltage: 110VDC or (Universal 24-240Vdc).	State		
	Evidence of sales in 3 other continents outside the continent ofmanufacture (state Countries)	State		
	Applicable protocol: IEC 61850-8-1and Goose messaging	State		
	Design type numerical	state		
	Supported communication protocols 60870- 5-103, 61850-9-2	State		
	Mounting design.(Flush)	State		
	suitable for use on a feeder in a 1&1/2 Breaker substation arrangement.(suitable/not suitable)	state		
2.	High speed output relays for circuit breaker opening (state no. of output relay).	State		
	Full Scheme Distance relay(scheme type)	state		
	Number of similar Relay sold to date to the export market: requirement; minimum number 1000	State		
	Minimum operating voltage and current for impedance measurement/directional sensitivity	State		
	Operating time for fast operating output relays	State		
	Operating time for other output trip relays	State		
3.	Tripping logic			
4.	Number of Zones of protection(state 1 or 2 or 3 or 4)	State		
5.	Zone Impedance Comparator Characteristics (state: mho, Quadrilatel.)	State		
6.	Impedance setting range for each Zone(state for Z1,Z2,Z3 and Z4)	State		
7.	Communication Aided Schemes for Distance Protection	state		
8.	Communication Aided schemes for Directional Earth Fault(DEF) Protection(state)	state		
	Pick up setting range for the DEF element(state in amps)	state		
	Load Encroachment Discrimination Feature(available/not available)	state		
9.	Fuse Failure Supervision(available/ not available)	state		
10.	Weak end in feed & Echo feature(available/not available)	state		
11.	Current reversal guard Feature(available/not available)	state		
12.	Power Swing Tripping & Blocking function(available/not available)	state		
13.	Voltage Memory Function (available/not available)	state		
14.	SOTF Function(available)	state		
	Settings range for the SOTF Function(time delay)	State		
15.	Back-up Overcurrent and Earth fault protection function	State		

	(available/not available)			
16.	Under-Frequency and rate of frequency change Protection function	State		
17.	Settings range for the Backup Overcurrent and Earth Fault Protection	state		
18.	Circuit Breaker contact wear feature(available/unavailable)	state		
19.	Broken Conductor detection(available/unavailable)	state		
20.	Auto-reclose Function that is able to operate as per the specifications	State		
21.	Accuracy for Distance to Fault Location (in %)	State		
	Automatic display of fault details on the Relay- List the fault data displayed	State		
22.	Storage capacity for disturbance records, trip/fault records and events records (No. of events and No of records)	indicate		
23.	Fault Locator with automatic Distance to Fault indication on the LCD screen in km. (available/unavailable)	state		
24.	Relay configuration & parameter settings, Event & Fault records andLED status are retained upon loss of relay DC Power supply	State		
25.	Metering provided	State		
26.	Number of Binary Inputs	State		
27.	Number of Binary outputs	state		
28.	Ratings for output relay contacts(current and voltage)	State		
29.	Number of LEDs	indicate		
30.	Communication protocols	state		
31.	Communication ports provided	State		
32.	Type and size of connection terminals for cable termination at the back of relay(type and diameter size)	state		
33.	Relay to Laptop connection cables offered (number and type).	state		
34.	Software for relay configuration and parameter setting and fault data Analysis offered with the relay in CD form.	indicate		

14B: GUARANTEES FOR BIASED DIFFERENTIAL RELAY FOR TRANSFORMER PROTECTION				
Item	**Particulars**	**Employer's Requirement**	**Quar. Value**	**Refer. Doc**
1.	Relay Manufacturer's name	State		
2.	Type or designation name of the relay offered	State		
3.	Complete order number of offered relay	State		
4.	Ratings: Ac Inputs: 1-5Amp	State		
5.	Power Supply Voltage: 110VDC or (Universal 24-240VDC).	State		
6.	Mounting design (Flush)	State		
7.	Applicable protocol: IEC 61850-8-1and Goose messaging	State		
8.	Design type numerical	State		
9.	Number of similar Relay sold to date to the export market: (requirement minimum number 1000)	State		
10.	Evidence of sales in 3 other continents outside the continent of manufacture(state countries)	State		
11.	Experience in manufacture of Biased Differential Protection relay (minimum 10 years)	state		
12.	Minimum of 5 years in service outside country of manufacture	state		
13.	Minimum operating current for biased differential /relay sensitivity and setting range	indicate		
14.	Minimum operating time at 2 x setting	indicate		
15.	Provision of unrestrained High-set differential element and setting range	indicate		
16.	Magnetizing Inrush detection method(s) and settings range	indicate		
17.	Provision of Integral CT correction ratio feature and setting range(available/unavailable)	state		
18.	Integral Vector Group compensation feature(available/unavailable)	state		
19.	Display of HV & LV differential and bias currents on the LCD screen(available/unavailable)	state		
20.	Storage capacity for Disturbance, Event and Trip/Fault records (disturbance, events and trips)	indicate for each		
21.	Display of Fault currents on the LCD(available/unavailable)	State		
22.	Provision of over-fluxing Alarm and Trip functions	State		
23.	5th Harmonic restraint feature and settings range	indicate		
24.	Dual- Bias characteristics(available/unavailable)	State		
25.	Relay trip Indication by Red LED (available/unavailable)	State		
26.	No of Binary Inputs	State		
27.	No. of Binary Outputs	state		
28.	Ratings of relay output contacts (current and voltage)	State		
29.	Number of LEDs	State		
30.	Ability to latch output contacts (available/unavailable)	State		
31.	Relay self-diagnostic with watchdog contact, relay healthy LED(green) and red LED for relay failure(available/Unavailable)	indicate		
32.	LCD screen and Keypad for programming relay parameter settings and data access(available/unavailable)	indicate		
33.	Communication protocols	State		
34.	Communication ports provided	State		

35.	Type and size of terminals for cable connection	State		
36.	Software offered for relay configuration and programming	indicate		
37.	Laptop to relay connection cable(offered /not offered)	indicate		
38.	Metering capability(U,I,P,Q,S,F,F&CosØ)	Indicate		

14C: GUARANTEES FOR RESTRICTED EARTH FAULT RELAY				
Item	**Particulars**	**Employer's requirement**	**Guara. Value**	**Refer. doc**
1.	Relay Manufacturer's name	State		
2.	Type or Designation name of Relay	indicate		
3.	Ratings: Ac Inputs: 1-5Amp	State		
4.	Power Supply Voltage: 110VDC or (Universal24-240VDC).	State		
5.	Design type: Numerical conforming to protocol IEC 61850-8-1and Goose messaging	State		
6.	Number of similar Relay sold to date to the export market: Requirement; 1000	State		
7.	Relay must have been sold to other two continents outside continent of manufacture(give names of the continents)	state		
8.	Experience in manufacture of Restricted Earth Fault Relay(number of years of manufacture)	Years		
9.	Minimum of 10 years Manufacturing experience	state		
10.	Minimum of 5 years in service outside country of manufacture	state		
11.	Complete order number for offered Relay	State		
12.	Applicable for High Impedance operating principle	indicate		
13.	Minimum pick up & setting range	State range		
14.	Relay Operating time at 5 x setting current(time in seconds)	indicate time		
15.	Number of LEDs	State		
16.	Number of Binary inputs	State		
17.	Number of Binary outputs	State		
18.	Ratings of output relay contacts(current and voltage)	State		
19.	Keypad for relay parameter settings and data access(available/unavailable)	State		
20.	Relay self-diagnostic with watchdog contact, relay healthy LED(green)and red LED for relay failure (available/unavailable)	State		
21.	Software for relay configuration and parameter setting. Software to be offered in CD form(yes/no)	Indicate		
22.	Connection cable from Laptop to Relay to be offered(yes/no)	Indicate		
23.	**Stabilizing Resistor**			
24.	Type and reference number of Stabilizing Resistor offered.	State		
25.	Setting Range of Offered resistor in Ohms (range in ohms).	State		
26.	Maximum through fault for the REF scheme calculation (in kA).	State		
27.	**Voltage Dependent Resistor (Metrosil)**			
28.	Type and reference number of Voltage Dependent Resistor (VDR)Metrosil offered. Rated voltage of VDR based on maximum fault current of 25kA.	State		
29.	Both Stabilising Resistor and Voltage dependent resistor are housed in a single box with external connection terminals suitable panelmounting.	State		
30.	Software for relay configuration and parameter setting	State		
31.	Connection cable from Laptop to Relay offered	State		

14E: GUARANTEES FOR FEEDER PROTECTION AND BAY CONTROL IED				
Item	**Particulars**	**Employer's requirement**	**Guara Value**	**Refer. Doc**
1.	Country of origin/Manufacture's Name	State		
2.	Applicable protocol IEC 61850-8-1and Goose messaging	State		
3.	Design type numerical	State		
4.	Type /Designation name of IED	State		
5.	Ratings: Ac Inputs: 1-5Amp	State		
6.	Power Supply Voltage: 110VDC or (Universal 24-240VDC).	State		
7.	Number of similar Relay sold to date to the export market: Required minimum1000 pcs	State		
8.	Experience of 10 years in manufacture of Feeder Protection & Control Relay	state		
	Years of Service outside country of Origin (5 years minimum)	state		
9.	Numerical design (numeric)	State		
10.	Protection functions and features in the IED i. Three phase overcurrent ii. Earth fault iii. Sensitive Earth Fault iv. Broken Conductor detection v. 3phase Autoreclose function vi. Under and Over Frequency Protection	State		
11.	Earth Fault and Sensitive Earth Fault Protection in separate element	State		
12.	Earth Fault and Sensitive earth fault elements shall have separate CT Inputs.	State		
13.	Two stages of High Set Element for both overcurrent and earth fault protection function-setting range of 1-20In (minimum) and a definite time delay setting of 0-60 seconds (minimum).	State		
	Current setting range for overcurrent 0.5In-2.0In (minimum)	State		
14.	Current setting range for earth fault 0.05In-0.8In (minimum)	State		
15.	Auto reclose function: i. Three phases auto reclose ii. Selectable 1-3 autoreclose shots iii. Independently set dead time for each shot iv. Autoreclose inhibit after manual close v. Autoreclose inhibition for over current high set element	State		
16.	Minimum of eight (8) each LEDs for alarms and trip annunciation.	State		
17.	Binary inputs and Outputs- minimum twelve (12 each)			
18.	Mounting design(Flush)	State		
19.	Number of CT inputs	State		
20.	Number of VT inputs	State		
21.	Protection and control Functions: Parameter setting range for each functionincluding time-current characteristics O/C, E/F, SEF, etc.	State		

SCHEDULE 14E: GUARANTEES FOR 3PHASE UNIDIRECTIONAL OVERCURRENT & E/ FAULT RELAY				
Item	**Particulars**	**Employer's requirement**	**Guara. Value**	**Refer. Doc**
1.	Manufacturer's Name	State		
2.	Type or Model of the Relay	type		
3.	Complete order number for offered Relay	State		
4.	Ratings: Ac Inputs: 1-5Amp	State		
5.	Power Supply Voltage: 110VDC or (Universal 24-240VDC).	State		
6.	Design type: Numerical conforming to protocol: IEC 61850-8-1and Goose messaging	State		
7.	Number of similar Relay sold to date to the export market: (Required minimum number is 1000)	Number		
8.	Experience in manufacture of Three Phase Overcurrent and Earth Fault Relay(10 years minimum)	state		
9.	Years of Service outside country of Origin (Minimum 5 years)	state		
10.	Design (Numerical type)	State		
11.	Mounting design(Flush)	State		
12.	Protection Functions offered and parameters setting range for all protection elements	indicate		
13.	Time-current characteristics available for various Overcurrent, Earth fault elements and other protection elements	State		
14.	Broken Conductor Function(available/unavailable)	State		
15.	Under frequency Protection(available/unavailable)	state		
16.	Circuit Breaker contact wear feature(available/unavailable)	State		
17.	Number of LEDs provided	state		
18.	Number of Binary Inputs	state		
19.	Number of Binary outputs	state		
20.	Ratings of output relays contacts(current, voltage)	state		
21.	Communication ports (type and number)	state		
22.	Communication protocols	state		
23.	Circuit Breaker maintenance(available/unavailable)	state		
24.	Relay self-diagnostic with watchdog contact, relay healthy LED (green) and red LED for relay failure(available/not available)	indicate		
25.	Configuration of Start and trip contacts(possible/not possible)	State		
26.	Storage capacity for disturbance, event and trip/fault records	State for each		
27.	Metering/Measurement capability(P,Q,I,V,CosØ)	Indicate		
28.	Size of LCD screen	State		
29.	Relay Keypad for relay parameter setting and data access	state		
30.	Software for relay configuration and parameter setting.	State		
31.	Connection cable from Laptop to Relay offered	state		
32.	Type and size of relay terminals for cable connection			

SCHEDULE 14F: GUARANTEES FOR SENSITIVE EARTH FAULT RELAY				
Item	**Particulars**	**Employer's requirement**	**Guara. Value**	**Refer. Doc**
1.	Manufacturer's Name	State		
2.	Type or designation name of relay	Type		
3.	Ratings: Ac Inputs: 1-5Amp	State		
4.	Power Supply Voltage: 110VDC or (Universal 30-300VDC).	State		
5.	Experience in manufacture of SEF Relay (10 years minimum)	state		
6.	Design type: Numerical conforming to protocol: IEC 61850-8-1	State		
7.	Years of Service outside country of origin (5 years Minimum)	state		
8.	Complete order number for offered Relay	State		
9.	Number of similar Relay sold to date to the export market: (Required minimum number is 1000)	Number		
10.	Current setting range for earth fault relay - 0.005In-0.8In	State		
11.	Definite time delay characteristic; Setting range, 0- 30 Seconds.	State		
12.	Circuit Breaker Maintenance function	State		
13.	Fault records, Event Records and disturbance records.	State		
14.	Drop off /pickup ratio >90%	State		
15.	Low transient overreach < 10%	State		
	Auto Reclose function			
i.	Autoreclose function shall be enabled in the distance relay or in the overcurrent and earth fault rely	State		
ii.	Selectable 1 - 3 autoreclose shots	State		
iii.	Independent set dead time for each shot	State		
iv.	Independent set dead time for each shot	State		
v.	Autoreclose inhibit after manual close	State		
vi.	Autoreclose inhibit for Overcurrent high set-element	State		
16	Connection cable from Laptop to Relay offered	state		
17	Software for relay configuration and parameter setting.	State		

SCHEDULE 14G: GUARANTEES FOR BUS BAR PROTECTION IED (IF OFFERED)				
Item	**Particulars**	**Employer's requirement**	**Guara. Value**	**Refer .Doc**
1.	Relay Manufacturer's name	State		
	Type or designation name of the relay offered	State		
2.	Complete order number of offered relay	State		
3.	Ratings: Ac Inputs: 1-5Amp	State		
4.	Power Supply Voltage: 110VDC or (Universal 24-240VDC).	State		
5.	Design type: Numerical conforming to protocol: IEC 61850-8-1and Goose messaging	State		
6.	Protection principle (low impedance on numeric principle)	State		
7.	Minimum of 10 years' experience in manufacture of Bus bar protection Relay	state		
8.	Minimum of 5 years in service outside country of Origin	state		
9.	Bus bar protection- centralised and phase segregated	State		
10.	Dynamic bus replica feature for each zone of protection	State		
11.	Mounting design (Flush)	State		
12.	Reference standards	state		
13.	Number of similar Relay sold to date to the export market: - (Required minimum number is1000)	State		
14.	Evidence of sales in two other continents outside the continent of manufacture (state countries)	State		
15.	Minimum operating time	Indicate		
16.	Check criteria for trip (check relay, zone relay)	Indicate		
17.	Detection of CT saturation within a few milliseconds into an external fault	State		
18.	Integral CT correction ratio feature and setting range	required		
19.	CTs trouble monitoring for each protected zone	required		
20.	Display of differential and Line current on LCD screen	required		
21.	Storage capacity for disturbance, Event and Fault records and Oscillographs (Input analogue to cover 20nos. bays)	indicate for each		
	Relay trip Indication by Red LED	required		
22.	No of Binary Inputs	State		
23.	No. of Binary Outputs	State		
	Ratings of relay output contacts (current and voltage)	State		
24.	Number of LEDs	State		
25.	Ability to latch output contacts	required		
26.	Relay self-diagnostic with watchdog contact, relay healthy LED (green) and red LED for relay failure (available/Unavailable)	required		
27.	LCD screen and Keypad for programming relay parameter settings and data access (available/unavailable)	required		

28.	Communication protocols (IEC 61850-8-1)	State		
29.	Communication ports provided	State		
30.	Overcurrent back up and end-fault protection (available/Not available)	State		
31.	Type and size of terminals for cable connection	State		
32.	Software offered for relay configuration and programming	indicate		
33.	Laptop to relay connection cable(offered /not offered)	indicate		
34.	Metering capability (U,I,P,Q,S,F,F& Cos Ø)	indicate		
35.	Connection cable from Laptop to Relay offered	State		
36.	Software for relay configuration and parameter setting.	State		

SCHEDULE 15: GUARANTEED TECHNICAL PARTICULARS FOR OPGW

GUARANTEES FOR OPTICAL GROUND EARTH WIRE					
Item	**Particulars**	**Unit**	**Employer's requirement**	**Guaranteed Value**	**Refer. Doc**
1	Name of Manufacturer and Country		State		
2	Minimum experience in manufacture of OPGW	Years	15		
3	Minimum years of service outside country of Origin	Years	7		
4	Number of fibers	OPGW	≥48		
	Single mode fiber type		G655		
5	Core diameter	µm	8.3/9 with 3% tolerance		
6	Fiber Cores per loose tube		12		
7	Fiber Color Coding –12 number		TIA-598 - C		
8	Clad diameter	µm	125.0 + 2		
9	Core-clad concentricity		< 2%		
10	Coating diameter	µm	250.0 + 15		
11	Coating concentricity	>	0.70		
12	Attenuation: 1310 nm 1550 nm	dB/km	< 0.40 < 0.25		
13	Bending attenuation: 1310nm 1550nm	dB/km	≤ 0.40 < 0.25		
14	Temperature dependence	dB/km	≤0.05 (-20°C to +85°C)		
15	Cut-off wavelength	nm	< 1250		
16	Chromatic dispersion:				
17	Zero dispersion at	nm	1310 ± 12 1550 + 15		
18	Zero dispersion slope (max.)	ps/nm^2 (km)	0.092 0.085		
19	Mode field diameter				
	1300 nm 1550 nm	mm mm	9.30 ± 0.50 10.50 ± 1.00		
20	IL-proof test level	g/m2	35 x 106		
21	Splice attenuation	dB/ splice	0.02		
22	Connector loss	dB/connector	< 0.5		
	Approach Underground Cable				
23	Manufacturer's Name and country	-	State		
24	Type	-	Armoured		
25	Number of fibers	-	>48		
26	Fibers per tube	No	12		
27	Long term Loading tensile	IEC 60794-1-2-E1A	1200N		
28	Short term Loading tensile	IEC 60794-1-2-E1B	2700N		
29	Crush Performance, Long term	IEC 60794-1-2-E3	800N/10cm		

GUARANTEES FOR OPTICAL GROUND EARTH WIRE					
Item	**Particulars**	**Unit**	**Employer's requirement**	**Guaranteed Value**	**Refer. Doc**
30	Crush Performance, Short term	IEC 60794-1-2-E3	3000N/10cm		
31	Minimal installation Bending radius	IEC 60794-1-2-E11	15 x OD		
	ODF				
32	Manufacturer's Name and country	-	State		
33	Type/model	-	State		
34	Number of fiber interconnections	-	$\geq$48		
35	Connector loss	dB/connector	< 0.5		
36	Screw on type connectors	-	yes		
37	Wall mounted cabinet	-	yes		
38	Fiber Optic Cable routine tests as per IEC 60794-1-2E/F	No	State all tests		

SCHEDULE 16: GAURANTEED TECHNICAL PARTICULARS -TELECOMMUNICATION SYSTEM

GUARANTEEES FOR TELECOMMUNICATION SYSTEM					
No	**Particulars**	**Unit**	**Employer's requirement**	**Guar Value**	**Refer. Doc**
1	Manufacturer's Name and country		State		
2	Multiplexer type		STM-4		
a	N x 2MBit Multiplexer		State		
b	Terminal equipment		State		
3	Minimum experience in manufacture of SDH Multiplexer	Years	15		
4	Minimum years of Service outside country Origin of the Multiplexer	Years	7		
5	Multiplexer technology		SDH & GBE		
6	SDH Capacity		622MBps		
7	GBE Capacity	MBps	STM-41000MBps		
8	Maximum extension of transmission capacity of terminal equipment by adding plug in cards		State		
9	Maximum extension for multiplexer and terminal equipment racks.		State		
10	Maximum extension of transmission capacity for the multiplexer based on 2MBit-hierarchy		State		
11	Integration to Existing NMS		Required		
12	Configurability from existing NMS		Required		
13	Telephony Voice Service capability		Required		
14	SCADA Data Service capability		Required		
15	CCTV Data Service capability		Required		
16	Teleprotection functionality standard as per IEC 60834-1		Required		
17	Craft Interface Connectivity to equipment		ITU-T G.773		
18	Optical interface for use between Teleprotection and digital Multiplexer		IEEE C37.94		
19	Data Communication channel to NMS and between nodes		ECC/ITU-T G.773		
20	Connection of PDH electrical tributary interfaces tothe SDH equipment		ITU-T G.703		
21	Synchronous optical interface protection		1+1 Protection		
22	Timing and synchronization		ITU-T G. 783		

SCHEDULE 17: GUARANTEED PARTICULARS FOR SUBSTATION AUTOMATION SYSTEM

	GUARANTEES FOR SUBSTATION AUTOMATION SYSTEM (SAS)				
Item	**Particulars**	**Unit**	**Employer's Requirement**	**Guara. Value**	**Refer. Doc**
1	Manufacturer's Name and Country	state			
2	Minimum manufacturing experience	Years	15		
3	Minimum years of service outside country of origin	years	7		
4	Reference IEC/BS/IEEE standards		state		
5	**Control system response and update time under"moderate load" conditions**		state		
	The control system shall be designed to yield the following response and update times under "moderateload" conditions		state		
i.	Time taken to completely refresh data held with the SCS: a. maximum b. average	 s s	State		
ii.	Time taken to carry out a complete status check of all indications and alarms a. maximum b. average	 s s	state		
iii.	The time between selection and display of a VDU diagram fully updated from the existing main computerdata base shall not exceed	s	State		
iv.	The time between selection of a control function andcheck back shall not exceed	s	state		
v.	The time between execution of a control function and successful completion being displayed at the OperationWorkshop shall not exceed for a. Circuit breaker (operating time = 250ms) b. Isolator (operating time = 10s)	 s	State State		
vi.	The time between the occurrence of the first change of state/alarm and display at the Operator Workstation shallnot exceed	s	state		
vii.	The time between selecting display of analogue measurements and the corresponding value in thedatabase being displayed shall not exceed	s	State		
viii.	The time between successive updates of the data basewith analogue measurements shall not exceed	s	state		
ix.	a. Network MW measurements b. Other analogue measurements	s s	State		
6	**Equipment reliability**				
	Mean time between failure shall be not less than:		state		

i.	Each computer	h	state		
ii.	VDU (Visual Display Unit)	h	state		
iii.	Logging printer	h	state		
iv.	System console	h	state		
v.	Communication system	h	state		
7	**Operator Workstation**				
i.	Reference standard		state		
ii.	Type designation		state		
iii.	Weight	kg	state		
iv.	Mounting arrangement		state		
	VDU				
v.	Reference standard		state		
vi.	Type designation		state		
vii.	Diagonal screen size	mm	state		
viii.	Usable display area	mm	state		
ix.	Weight	kg	state		
x.	Mounting arrangement		state		
	Alphanumeric Keyboard				
xi.	Reference standard		state		
xii.	Type designation		state		
xiii.	Mounting arrangement		state		
8	**SAS System**				
i	Manufacturer of RTU/ Gateway Gateway Data Transmission Capability • IEC 60870-5-101 • IEC 60870-5-104 • IEC 60870-5-104 Transmission on echo off mode	yes	State		
ii	Common Time Base – Synchronisation a) GPS Synchronisation b) Time tags between RTUs	ms	state		

iii	Functionality of the new RTU • Single command outputs, • Double command outputs • Regulation command outputs e.g. raise/lower command outputs for transformer tap changer control • Analog set point transmission and output • Single, double and multiple state digital inputs • Analogue measured inputs • Metering pulse inputs for acquisition of energy meter values • Sequential Event Recording (SER) with time stamping of events at the RTU • Self-testing and diagnostic functions for detectionand reporting of any error • Automatic re-starting function	SCO DCO RCO SPI & DPI AMI µsec Required	 State		
iv	Database and parameter setting by menu-controlleddialogues from a local PC and remotely Equipment Input Power Supply Signal Hardwiring Capability	Require VDC Required	State 48 State		

SCHEDULE 18: GUARANTEED PARTICULARS FOR MEASURING INSTRUMENTS

GUARANTEES FOR MEASURING INSTRUMENTS				
Item	**Particulars**	**Unit**	**Guar' Value**	**Refer .doc**
1	**Indicating Instruments**			
	AC and DC Ampere meter, and Voltmeter, Wattmeter, VAr - meter, Frequency-meter and other indicating instruments:			
i	Physical dimension Instrument for: (A, V (AC), V (DC), W, etc.)	(mm)		
ii	-Reference standard	list		
iii	- Error	%		
iv	- Max. admissible current	%.I_N		
v	- Max. admissible voltage	%.I_N		
2	**Energy meters (to be filled for each meter)**			
i	Meter for (MWh, MVArh) Physical dimension	mm		
ii	-Error with 5% load	%		
iii	-Error with 10% load	%		
iv	-Error with 20% load	%		
v	-Error with 100% load	%		
vi	-Max. admissible current	%.I_N		
3	**Metering Converters (Transducers)**			
i	- Converter for (MW, MVAr, A, etc):			
ii	- Error	%		
iii	- Linearity	%		
iv	- Max. admissible current for 0.5 seconds	%.I_N		
v	- Max. admissible current continuously	%.I_N		
vi	- Max. admissible voltage for 0.5 seconds	%.I_N		
vii	- Max. admissible voltage continuously	%.I_N		
4	**Alarm/Trip Annunciators**			
i	- Reference standard			
ii	- Digital type			
	(i) Digital and Analogue inputs/output			
iii	- Number of windows per annunciators (minimum 8)	No		
iv	- Physical size of each annunciator (area of the cap)	mm		
	i) Reset and mute button			

Note: ***To be filled in for each instrument***

SCHEDULE 19: GUARANTEED TECHNICAL PARTICULRAS FOR LV CABLES

GUARANTEES FOR CONTROL AND SIGNAL CABLE					
Item	**Particulars**	**Unit**	**Employer's requirement**	**Guara' value**	**Refer. Doc**
I	**Low Voltage Cables (Auxiliary Supply)**				
i	- Conductor material		Copper		
	Design type		Concentric and stranded		
ii	- Current carrying capacity at 75° C	A	State		
	(iv) Rated Voltage	kV	state		
	(v) 1min. frequency voltage power withstand	KVrms	state		
iii	(vi) Short circuit current withstand for 3secs	KA	State		
iv	- Insulation material		PVC		
v	- steel wire Armouring and screen		Required		
vi	- Protective coating		Required		
vii	- minimum nominal diameter		25mm^2		
viii	- Weight of heaviest reel, including cable - Number of cores	Kg No	Kg four		
2	**Control, Protection and Measuring Cables**				
i	- Conductor material		Copper		
	ii) Design type		Concentric and stranded		
ii	- Insulation material		PVC		
	- Current carrying capacity at 75° C	A	State		
	(viii) Rated Voltage	kV	1		
	(ix) 1min. frequency voltage power withstand	KVrms	3		
iii	- steel wire Armouring and screen		required		
iv	Protective coating		required		
v	- Nominal diameter per core		2.5mm^2		
vi	- Overall diameter of cable and number of core	mm/No	state		
vii	- Weight of heaviest reel, including cable	kg	state		
viii	- Size of biggest reel, diameter/width	mm/mm	state		
3	**Telecommunication and Relay/Control Panelinternal wiring cables**				
i	- Conductor material		Copper		

	(xi) Design type		Concentric and stranded		
ii	- Rated voltage	V	600		
	- Insulation material		PVC		
	(xii) 1min. power frequency voltage withstand	KVrms	state		
iii	- Flexible stranded single core		state		
iv	- Nominal diameter per core (minimum)		1.5mm^2		
v	- Overall diameter of cable and number of core	Mm/No	State		
vi	- Weight of heaviest reel, including cable	Kg	State		
vii	- Size of biggest reel, diameter/width	mm	State		
4	**Special Cables and Optical fibres (whereapplicable)**				
i	-Special signal and data applicable		state		
ii	-Conductor material		state		
iii	-Insulation material		state		
iv	-Mode of protection		state		
v	-Diameter per core		state		
vi	-Overall diameter of cable reel		state		

SCHEDULE 20: GUARANTEED TECHNICAL PARTICULARS FOR 33 AND 11KV AUTORECLOSER

GUARANTEES FOR 11 AND 33KV AUTORECLOSRER					
Item	**Description**	**'s requir'**	**Guaranteed Value**		**Refer Doc.**
			33KV	**11KV**	
1.	Manufacturers name and address	state			
2.	Model or Type of Autorecloser	state			
3.	Equipment applicable standards	state			
4.	Minimum autorecloser Manufacturing experience (10 years)	state			
5.	Minimum years of service outside country of Manufacture (5years)	state			
6.	Autorecloser tank material	state			
7.	Arc interruption and insulation medium	state			
8.	Status Indication	state			
9.	Inbuilt current transformers and ratings (630A and STC of ≥ 16 kA)	provide			
10.	Material of conductive parts (Copper with the contacts silver-plated)	state			
11.	Local Mechanical trip facility and interlocks.				
12.	HV bushing material (HCEP or silicon rubber, UV treated)	state			
13.	Primary terminal clamps (Bimetallic, min. Φ20mm)	state			
14.	Surge arrestor and earthing points	state			
15.	Operating mechanisms type (Magnetic actuator) and number of trips in a cycle	state			
16.	Autorecloser Lockout link , electrical and mechanical interlocks	list			
17.	Manual closing, and Automatic Blocking Device for Manual opening	state			
18.	Visible on the ground reflector mechanical open/closer indicator	state			
19.	Operation counters	state			
20.	Padlocking facility	state			
21.	Number of operations to the first maintenance	state			
22.	Equipment rated Voltage	state			
23.	Rated continuous operating current (minimum)	state			
24.	Minimum Power Frequency Withstand Voltage, rms (50Hz, 60s)	state			
25.	Minimum Lightening Impulse Withstand Voltage, 1.2/50μs, +ve, dry, KV_{peak}	state			
26.	Minimum rated short time withstand current for symmetricalfault for 3 seconds, kA	state			

27.	Rated short circuit breaking current (kA)	state			
28.	Rated peak value withstand current $kA_{(peak)}$	state			
29.	Opening Time	state			
30.	Closing Time	state			
31.	Interrupting Time	state			
32.	Rated recloser Operating Sequence	state			
	Control enclosure [IP] class of protection	state			
	Min. creepage distance of insulator	state			
	Min. clearance - phase to phase to phase to earth	state			
	Min. number of Mechanical & Full Load Operations in life time	state			
33.	Electronic modules for upgrade and communication	state			
34.	Control and communication cable to Laptop	state			
35.	Communication port USB(latest), RS 232, RS 485 and Ethernet	state			
36.	**Control box features**	state			
37.	Programmable digital (alphanumerical) keypad	state			
38.	LCD Screen	state			
39.	Control /Functions Keys	state			
40.	Electrical Close and Open Push-button	state			
41.	Indications and Status display	list all			
42.	Autoreclosers Control Failure	state			
43.	Autoreclosers Safety Control	state			
44.	Application Software	provide			
45.	Autoreclosers control and setting software (No expiry license	state			
46.	Manufacturer's warranty (18 month minimum)	state			
47.	Auxiliary DC supply via rechargeable Battery (12/24Vdc)	state			
48.	SCADA communication support via IEC 61850 and IEC 60870-5-101/104 communication protocol.	state			
49.	230Vac/50Hz Auxiliary Power Supply (External VT)	state			
50.	Protection and Control Functions				
	a)Three Phase Over-Current Protection				
	Relays Operating Characteristics	state			

	Protection Functions Available	state			
	b) Earth Fault Protection Function				
	Setting Ranges for Earth Fault Protection (50N/51N)	state			
	Setting Ranges for Sensitive Earth Fault Protection (50N-2/51N-2)	state			
	Sensitive Earth Fault Functions and settings	state			
	Cold load pick up function	state			
	Inrush feature	state			
51.	Auto Reclose Function				
	Sequence of trip and auto-reclose characteristics	state			
	Setting Ranges for Auto Reclose Function (1…….4 Shots to Lockout Independently selectable for OC& EF)	state			
52.	Software Functions/Features				
	Trips to lock-out	state			
	Operations counters	state			
	Fault and Event Records logging	state			
53.	Energy and Power Measurements				
	Measurands displayable on the LCD screen	state			
	Instantaneous values rms (I, V, kW, kVA, kVAR, pf)				
	Energy measurements (KW, KVA, I, KVAR kVARh, kWh)	state			
54.	Remote Operation and control Via Scada and Laptop	state			
55.	Events & Fault Records Lists	state			
56.	Battery guarantee and warranty of at least 5 years.	state			
57.	Spare Auxiliary contacts – minimum Nos.	state			
58.	Applicable FAT Routine Tests as per IEC standards	state			
59.	Type Test and Certificates	list			
60.	Accreditation Certificate as per ISO/IEC 17025 of Testing Laboratory	list			
61.	Name plate and marking	provide			
62.	Phase Markings/Identification	provide			

SCHEDULE 21: GUARANTEED TECHNICAL PARTICULRAS FOR GRID EARTH CONDUCTOR

GUARANTEES FOR EARTH CONDUCTOR					
Item	**Particulars**	**Unit**	**Employer's requirement**	**Guar. Value**	**Refer .Doc**
1	Maximum Earth ground resistance desired values				
	Under the Control building	Ohms	State		
	Under the Switchyard (HV Earthing system)	Ohms	State		
	LV Earthing system	Ohms	State		
2	Material for Main Grid and Risers earthing conductor		Copper		
3	Resistance of Main earth grid conductor at 20°C	Ω/km	State		
4	Minimum nominal cross section area of main grid and risers	mm^2	95		
5	Max. temperature of earth conductor during 3 Sec.rated phase - ground fault	O^0C	State		
6	Rated Phase to ground fault current of main gridconductor at rated maximum temperature	kA	State		
7	Material for Earth rods		Copper		
8	Maximum resistance of each Earth rod	Ohms	State		
9	Length and diameter of earth rods	M/mm	State		
10	Method of interconnecting earth grid conductors		State		

12. ATTACHMENTS

i) Typical Single line drawing - 2.5MVA 33/11kV Substation

ii) Technical Specification for Major Equipment and Materials

MANAGEMENT OF ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY (ESHS)FOR THE WORKSITE

Table of Content

A. Essential Worksite Environmental, Social, Health and Safety Management(ESHS) Requirements

The following **Essential ESHS Issues of Worksite Management** as stated in bidding document Volume I shall apply to this Contract and shall be priced by the Bidder under the specific ESHS Cost Schedule:

Essential ESHS Worksite requirements	
1	ESHS resources and facilities, ESHS monitoring Program
2	Health & Safety of workers and general public health on worksites
3	Local recruitment and trainings on Essential ESHS worksite activities of subcontractor's and contractor's site staffs
4	Relations with stakeholders management, creation of awareness and consultation with local communities and authorities for smooth implementation of the project
5	Control of infectious and communicable diseases at worksite (HIV/AIDS and COVID-19)
6	Vegetation clearing, Site rehabilitation and revegetation
7	Waste management and control of noise and dust pollution at worksite

The bidder shall describe the in the ESHS cost schedules and work methodology each Services/Items to be provided in every category of Essential ESHS worksite requirements. All ESHS activity shall be deemed to have been included in the bid price and no variation shall be accepted. All payment certificates/invoices shall be support by documentary evidence of services/items provision at worksite.

Throughout the ESHS Specifications, a reference to Conditions of Contract, abbreviated by GC, means a reference to both the General Conditions of Contract and the Particular Conditions of Contract.
As per GC when interpreting the Contract, the terms of the Particular Conditions of Contract prevailover those found in the General Conditions of Contract.

B. Environmental, Social, Health and Safety Management System

1. Responsibilities and liabilities

1.1. In conjunction with his obligations defined under the Contract, the Contractor will plan, execute and document construction works pursuant to the present Environment,Social, Health and Safety specifications (ESHS).

1.2. The Contractor is liable for all damages to natural resources caused by the execution of the works or the methods used for execution, unless it is established that the execution or methods were necessary, according to the provisions of the Contract or an Engineer's instruction.

1.3. Under the Contract and as introduced by the present ESHS Specifications, the term "Project Area" means:

a) The land where work will be carried out; or

b) The land necessary for the implantation of construction facilities (work camp, workshops, offices, storage areas, concrete production plants) and including special access roads; or

c) Quarries for aggregates, rock material and riprap; or

d) Borrow areas for sand and other selected material; or

e) Stockpiling areas for backfill material or other demolition rubble; or

f) Any other location, specifically designated in the Contract as a Project Area.

The term "Project Area" encompasses any individual Project Area or all Project Areas.

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Project Area defines an area within which the Contractor is to comply with environmental, social, health and safety obligations defined in the present ESHS Specifications.

Site is the places where the Permanent Works are to be executed and to which Plant and Materials are to be delivered, and where right of access to, and possession of, is tobe given by the Employer to the Contractor. The Employer is under no similar obligation for any area located outside the Site, even if within the Project Area, where access is at Contractor's risk.

1.4. The ESHS Specifications/requirements refers to:

a) Protection of the natural environment (water, air, soil, vegetation, biological diversity) in areas within any Project Area and its surroundings, i.e. including but not limited to access roads, quarries, borrow areas, stockpiling of backfill material, camps or storage areas;

b) Health and safety conditions to be maintained for the Contractor's personnel andany other person present on the Project Areas, or along access routes;

c) Working practices and the protection of people and populations living near the Project Area, but exposed to the general disturbance caused by works.

1.5. Subcontractors

The present ESHS Specifications apply to the Contractor and unless explicitly agreed with the Project Engineer, all Subcontractors used for the execution of the Works. Pursuant to Sub-Clause of the G C, the Contractor is fully liable for all actions, non-compliance and negligence by Subcontractors, their representatives, employees and workers, to the same degree as it would be held liable for its own actions, non-compliance or negligence or that of its own representatives, employees or workers.

1.6. Applicable regulations

The Contractor must identify all regulations in relation to the protection of the environment (water, air, soils, noise, vegetation, fauna, flora, waste, groundwater) and, pursuant to Clauses of the GC, the protection of people (labour law, indigenous populations, standards on occupational exposure, other). The Contractor must list all texts, standards and other regulatory limitations in its Worksite Environmental and Social Management Plan and specify the means taken for compliance.

2. ESHS Planning Document

2.1. Worksite Environmental and Social Management Plan (Worksite - ESHS)

2.1.1. The Contractor prepares and ensures prior validation by the Project Engineer, implementation and regular update of a Worskite Area Environmental and Social Management Plan (Worksite - ESMP).

2.1.2. The Worksite - ESMP represents the unique reference document in which the Contractor defines in detail all organisational and technical provisions implemented to satisfy the obligations of the present ESHS Specifications.

2.1.3. The Contractor defines in the Worksite - ESMP the number, the locations and thetype of Project Area as defined in ESHS Specifications Sub-Clause 1.3. For eachof the identified Project Area, unless otherwise agreed by the Engineer, the Contractor establishes an Environmental Protection Plan (EPP). The EPP(s) are annexed to the Worksite - ESMP.

2.1.4. The Worksite - ESMP covers the entire period from the Contract Agreement signature date to the date of issue of the Performance Certificate by the Engineer.

2.1.5. The first draft version of the Worksite - ESMP is to be provided by the Contractor to the Project Engineer within 28 days from the date of execution of the ContractAgreement.

2.1.6. Unless the Engineer, within 21 days after receiving a programme, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the programme, subject to his other obligations under the Contract. The Employer's Personnel shall be entitled to rely upon the programme when planning their activities.

2.1.7. No physical work or activity shall commence on any Project Area until such time the Worksite - ESMP, and the annexed EPP corresponding to the Project Area, are approved by the Project Engineer.

2.1.8. During the execution of the works, whenever instructed by the Project Engineer, the Worksite - ESMP will be updated by the Contractor and reissued to the Engineer. The revised version shall highlight the new elements incorporated in the document.

2.1.9. The Worksite - ESMP (and the EPP) is structured according to the planspecified in Appendix 1 of the present ESHS Specifications.

3. Management of Non-Conformities

3.1 In application of Clause 5, non-conformities detected during inspections carried out by the Engineer are subject to a process adapted to the severity of the situation. The non-conformities will be defined as deviations from the requirements of the applicable regulations, the present ESHS Specifications, the ESMP, and the Worksite - ESMP. Non-conformities are divided into 4 categories as follows:

3.1.1 Notification of observation of minor non-conformities. The non-conformity results in a notification to the Contractor's Representative, followed-up by a signed notification of observation prepared by the Project Engineer. The multiplication of notifications of observation at the Project Area, or absence of corrective actions by the Contractor, can result in the severity of the non-conformity being raised to that of level 1.

3.1.2 Level 1 non conformity: Non-conformities that do not represent a serious immediate risk for health, environment, social or safety. The non-conformity is the subject of a report addressed to the Contractor and which shall be resolved within five (5) days. The Contractor addresses to the Project Engineer a report explaining how the non-conformity has been corrected. Further to aninspection and a favourable evaluation of effectiveness of the corrective action, the Project Engineer signs a close-out report for the non-conformity. Inall cases where a non-conformity of level 1 is not resolved within one (1) month, the severity of the non-conformity is raised to level 2.

3.1.3 Level 2 non-conformities: applies to all non-conformities that represent a risk with major consequences to health and/or the environment, social or safety. The same procedure as for level 1 non-conformities is applied. Corrective action shall be taken by the Contractor within three (3) days. The Contractor addresses a report explaining the corrective actions implemented. All level 2 non-conformities which are not resolved within one (1) month, are raised to level 3.

3.1.4 Level 3 non-conformities: applies to all non-conformities that have resulted in damage to health or the environment, or which represent a high safety hazard or high social risk. The highest levels of the Contractor's and Engineer's hierarchies present in the Employer's country are informed immediately and the Contractor has twenty-four (24) hours to bring the situation under control. A level 3 non-conformity results in the suspension of interim payments until the non-conformity has been resolved. If the situation requires, and in pursuance to Clause 8.8 of the PC, the Engineer can order the suspension of work until the resolution of the non-conformity.

4. Resources allocated to environmental management

4.1. ESHS supervisors

4.1.1. The Contractor shall appoints an Environment, Social, Health and Safety officer in charge of implementing the essential ESHS requirements.

4.1.2. The ESHS supervisor shall be based at the Project Area for the full duration of the works as of Contractor's mobilisation until Taking-Over Certificate is issued.

4.1.3. This officer holds the power within the Contractor's organisation to be able tosuspend the works if considered necessary in the event of level 2 or 3 non-conformities, and allocate all resources, personnel and equipment required to take any corrective action considered necessary.

4.1.4. ESHS supervisor's role is to ensure that the works are carried out pursuant tothe present ESHS Specifications and notify the ESHS office of any detected non-conformities.

4.2. Person in charge of relations with external stakeholders

4.2.1. The Contractor appoints a person responsible for relations with external stakeholders: local communities, administrative authorities, and representatives of economic activities located within one hour travel from theProject Area.

4.2.2. The person responsible for relations with external stakeholders can also be the ESHS supervisor appointed under Sub-Clause 4.1.1 of the ESHS Specifications.

4.2.3. This person will be based on the Project Area on a permanent basis.

4.2.4. Administrations and local authorities will be informed of the existence of this person as of the start of works and will be provided with telephone contact details so as to be able to contact this person if a problem arises during the execution of works, or concerning the behaviour of the Contractor's Personnel,inside or outside the Project Area.

4.3. The ESHS supervisor will be allocated the necessary resources to operate independently.

5. Inspections

5.1. The ESHS supervisor will carry out an ESHS inspection of the facilities and Project Area on a weekly basis jointly with the Engineer.

5.2. A written report will be drafted for each weekly inspection, in a format approved by the Engineer, addressing non-conformities detected on the Project Area as specified inthe present ESHS Specifications.

5.3. Each non-conformity will be documented by a digital photograph with captions to provide a visual illustration, explicitly indicating the location, date of inspection and the non-conformity in question.

6. Reporting

6.1. As part of the Progress report the Contractor submits an ESHS activity report summarising all ESHS initiatives implemented in relation to the execution of the works during the reporting period to the Engineer on a monthly basis. The activity report is aseparate document from the update of the Worksite - ESMP, which is updated at the intervals indicated in Sub-Clause 2.1.9 of the present ESHS Specifications.

6.2. The ESHS activity report is submitted at the latest 7 working days after the last day ofthe month in question. The report contains the following information.

6.2.1. List of ESHS personnel present at the site at the end of the month.

6.2.2. Construction works activities conducted during the reporting period.

6.2.3. Inspections carried out (location and intervals).

6.2.4. Non-conformities detected during the reporting period with descriptions of the root cause analysis and corrective actions taken.

6.2.5. Description of activities conducted and measures taken during the reporting period to remedy non-conformities and to manage environmental, social, health and safety risks and impacts

6.2.6. Description of stakeholder engagement activities undertaken with neighboring populations, local authorities, governmental agencies.

6.2.7. Monitoring results for the following indicators:

a) Control of infectious diseases at worksite (COVID-19)
b) Drinking-water quality
c) Hazardous and non-hazardous waste generation
d) Air and noise emissions
e) Recruitment and number of Local laborers hired by Contractor's

6.2.8. Health & safety statistics: number of fatal accidents, lost-time accidents, number of accidents without lost-time, serious illness, frequency of accidents, and serious misconduct by Contractor's Personnel (record sheet to be attached as an appendix to the activity report, pursuant to ESHS Specifications/requirements.

6.2.9. Description of the formal or informal objections (negative media attention, strikes or labor disputes, protests, complaints from communities, NGO or workers or formal notice from authorities…) related to environmental, social, health and safety risks and impacts of the works; including root cause analysis and corrective actions taken.

6.2.10. Report on training of workers on ESHS activities (topic, number and duration of sessions, number of participants).

6.2.11. Provisional environmental, social, health and safety actions for the coming months.

6.3. Accident notification

6.3.1. The Engineer is informed within one hour of any accident involving serious bodily injury to a member of personnel, a visitor or any other third party, caused by the execution of the works or the behaviour of the personnel of theContractor.

6.3.2. The Engineer is informed as soon as possible of any near-accident relating to the execution of the works which, in slightly different conditions, could have led to bodily injury to people, or damage to private property or the environment.

7. Rules of procedure

7.1. Rules of procedure are established by the Contractor for the Project Areas, addressing the following: safety rules, zero tolerance for substance abuse (refer to Clause 37), environmental sensitivity of areas around the Project Areas, the dangers of STDs and COVID-19, gender issues (in particular sexual harassment) and respect for the beliefs and customs of the populations and community.

7.2. The rules confirm the Contractor's commitment to implementing the ESHS provisionsprovided for in the Contract.

7.3. New Contractor's Personnel and existing Contractor's Personnel are made aware and acknowledge their understanding of the rules of procedure and the associated provisions. Rules of procedure document are initialed by all Contractor's Personnel prior to the start of any physical work at any Project Area.

7.4. The rules of procedure include a list of acts considered as serious misconduct and which must result in dismissal from any Project Area by the Contractor, or by the Engineer if the Contractor is not acting in due course, should a Contractor's Personnelrepeatedly commit an offence of serious misconduct despite awareness of the rules ofprocedure, and this is without prejudice to any legal action by any public authority fornon-compliance with applicable regulations:

a) Drunkenness during working hours, leading to risks for the safety of local inhabitants, customers, users and personnel;

b) Punishable statements or attitudes, and sexual harassment in particular;

c) Violent behavior;

d) Intentional damage to the assets and interests of others, or the environment;

e) Repeated negligence or imprudence leading to damage or prejudice to the environment, the population or properties, particularly breaching provisions intended to prevent the spreading of COVID-19 and AIDS;

f) Drug use and drug trafficking

g) Possession and/or consumption of meat or any other part of an endangered animal or plant as defined in the Kenyan Laws.

7.5. The Contractor establishes a record for each case of serious misconduct, and a copy will be provided to the Contractor's Personnel in question, indicating all action taken to terminate the misconduct by the Contractor's Personnel in question and to bring theattention of other Contractor's Personnel to the type of incident detected. This record will be provided to the Engineer as an attachment to the ESHS activity report.

8. ESHS Training

8.1. The Contractor prepares a training programme for its Contractor's Personnel/its siteemployees as described in the Essential Worksite activities

8.2. Training sessions are two-fold: introductory sessions for starting work at the ProjectArea, and technical training as required in relation to the execution of the works.

8.2.1. Starting work sessions are organised for each Contractor's Personnel and shallcover as a minimum:

a) Rules of procedure;
b) Safety rules on Project Areas;
c) Risks relating to sexually transmitted diseases and COVID-19, prostitution,humand sexual harassment;
d) Basic health: combating malaria (if prevalent) and waterborne diseases, improving hygiene;
e) Emergency response procedures or evacuation.

8.2.2. Technical training:

a) Training in the skills needed for tasks requiring a work permit
b) Training in first aid and transporting the injured

8.3. The Contractor details in the training programme the actions and ESHS training forSubcontractors and other members of the joint venture when applicable.

8.4. The Contractor prepares an awareness program for local communities on the risks ofprostitution, AIDS, COVID-19 etc.

9. Standards

9.1. The Contractor complies with all norms, standards and discharge limit values defined in the Kenya national regulations and pursuant to Sub-Clause 1.6 of the present ESHS Specifications/requirements.

9.2. The Contractor complies with norms, standards and discharge limit values recommended by the specialised international organisations affiliated to the United Nations, as described in ESHS Specifications Sub-Clause 9.3 below.

9.3. The specialised international organisations affiliated to the United Nations referred toin ESHS Specifications Sub-Clause 9.2 include:

a) World Bank, including the IFC and its Environmental, Health and Safety guidelines available from http://www.ifc.org/ehsguidelines;

For matters not addressed in the IFC above document, the most stringent of thenorms, standards and discharge limit values of the following institutions shall apply:

a) World Health Organization (WHO);

b) International Labour Organization (ILO) (in particular in pursuance to Clauses 6.20,6.21, 6.23 and 6.24 of the CC);

c) International Maritime Organization (IMO).

C. Protection of the Environment

10. Protection of adjacen tareas

10.1. Unless instructed otherwise by the Project Engineer, the Contractor uses construction methods and means of protection in order to avoid or minimize adverse effects that are incurred on vegetation, soils, groundwater and surface water, biodiversity, natural drainage and the water quality in areas within any Project Area and its surroundings for the entire duration of the works.

10.2. Wetland areas include marshes, fens, mires or natural or artificial bodies of water, whether permanent or temporary, where water is stagnant or flowing, fresh, saline or briny, including seawater with a low-tide depth of six meters or less. Filling of all or part of a wetland area is not permitted, unless the works are necessary according to the provisions of the Contract or the instructions ofthe Engineer.

10.3. With the exception of access roads, or unless instructed otherwise by the Engineer, the entire perimeter of land sites with a surface area of less than 2 hectares is physically demarcated with a fence or tape. For Project Area with a surface area of more than 2 hectares, the perimeter will be physically demarcated by a perimeter track, road, signs or any other means leaving no possible ambiguity as to the location of the Project Area perimeter.

10.4. Unless instructed otherwise by the Project Engineer, the Contractor defines the perimeter of the Project Area at a distance of at least:

a) 50 m from any permanent water course and outside of floodable areas;
b) 300 m from sensitive urban services and buildings (health centre,school, water supply for populations);
c) 200 m from any housing; and
d) 300 m from housing in the specific case of work requiring the use ofexplosives.

10.5. If the footprint of the works are located in the situations (a) to (d) of the ESHS Specifications Sub-Clause 10.4 above, and unless agreed upon otherwise by the Project Engineer, the Contractor will contract a bailiff to make a sworn statement regarding the existence and conditions of residential buildings situated around the site with a distance specified in paragraph (b) to (d) of ESHS Specifications Sub-Clause 10.4

10.6. The bailiff's sworn statement is prepared and provided to the Project Engineer with the EPP.

11. Selection of borrow areas, backfill material stockpile sitesand access road

11.1. The Contractor will submit to the Project Engineer for prior approval, (i) the location of proposed borrow areas or areas to be excavated, or (ii) proposed backfill material stockpile locations or zones designated for the rubble from demolition works.

11.2. This requirement also applies to the side casting during the construction of linear infrastructure (roads, pipelines, transport routes) and which are includedin the category of stockpiling of waste material.

11.3. The opening or rehabilitation of all access routes between Project Areas will be shown on a map and approved by the Engineer prior to the start of the corresponding works.

12. Effluents

12.1. Effluents consist of liquid discharges, including infiltration, from ProjectArea, transporting a pollutant (dissolved, colloidal or particles).

12.2. A pollutant is a given chemical compound that is at a concentration that is greater than the limit values recognised for that compound according to the Clause 9 of the present ESHS Specifications.

12.3. No effluent is discharged by the Contractor into water courses, soils, lakes or the marine environment without prior treatment and without monitoring of thetreatment's performance to guarantee the absence of pollution.

12.4. Where applicable Contractor will list, locate, and characterise (flow, expected quality, discharge frequency) all sources of effluents and outlets in the natural environment in the Environment Protection Plan(s).

12.5. The Contractor will submit to the project Engineer an effluent quality monitoring report (where applicable) on a monthly basis, including documentation for the following for each effluent discharge point: (i) average flow rates of discharged effluents, (ii) discharge frequencies and durations over the month, and (iii) the physical and chemical quality of the effluent discharged, for the conformity parameters listed in ESHS Specifications Sub-Clause 12.1above.

12.6. The special case of rainwater run-off

12.6.1. Run-off consists of the rainwater flow on the surface or the soil and other technical surfaces at Project Areas.

12.6.2. In the context of the Contract, run-off is considered as an effluent unless demonstrated otherwise, as documented and substantiated by the Contractor, and approved by the Engineer.

12.6.3. All platforms where generators, hydrocarbon storage tanks and refueling stations are installed have impervious surfaces, are drained and equipped with an oil removal treatment to prevent pollution pursuant to ESHS Specifications Sub-Clause 12.3 above. For concrete platforms, run-off will be drained to settling basin, where the pH will be buffered.

13. Atmospheric emissions and dust

13.1. Emissions refer to any discharge into the air of solid substances, aerosols, gases, radiation, or energy, whether point sources (e.g. incineration stack) ordiffuse (e.g. fugitive dust emissions from road use by trucks).

13.2. The Contractor will use equipment and adopt construction and transportmethods with atmospheric emissions which are not in excess of the threshold
emission values recommended by the Employer's country standards, or theorganisations mentioned in Clause 9.

13.3. Once having received the agreement from the project Engineer, the Contractor will document the maintenance records for its fleet of vehicles,
machinery and equipment emission control.

13.4. On unpaved roads used by the vehicles and machinery of the Contractor:

13.4.1. The Contractor takes action to abate fugitive dust emissions generated by vehicles or mobile equipment in residential areas and on roads within the Project Area perimeter.

13.4.2. The abatement measures include the regular application of water or any other non-hazardous dust suppression agents, reduction of vehicle speedin and near sensitive receptor areas. Contractor vehicle speed limits arespecified in ESHS Specifications Sub-Clause 44.8

13.4.3. The Contractor will implement any other control measures approved bythe project Engineer.

13.5. When storage, transport and handling of bulk materials is made in the open air and exposed to the wind, the Contractor implements the necessary dust abatement measures, including one or several of the following techniques: humidification of the surface, covering of the surface, or vegetation of the surface.

14. Noise and vibration

14.1. The Contractor uses equipment and adopts construction and transport methodsso not to generate noise levels in excess of values recommended by the Employer's country regulations and organisations mentioned in Clause 9.

14.2. High noise generating works (e.g. pile driving, blasting, rock clearing, drilling, percussion drilling) inducing an increase of 3 dB in ambient noise levels at the nearest occupied receptor area are carried out during normal working days, but prohibited at night between 18:00 and 06:00. A receptor isdefined as an area used for nocturnal socioeconomic activities (e.g.
accommodation camps, residential areas, hotels, health centres).

14.3. The use of heavy vehicles at night is specified in ESHS Specifications Sub-Clause 44.7.

15. Waste

15.1. The Contractor is responsible for identifying, collecting, transporting and treating all waste produced on the Project Areas by its personnel, Subcontractors and visitors.

15.2. The Contractor establishes and maintains a waste register which is at the disposal of the project Engineer. This register will record all waste management operations: production, collection, transport, treatment. The following aspects are documented in this register:

a) Type of waste, using the nomenclature specified in ESHS Specifications Sub-Clause 15.6;

b) Waste quantities;

c) Name and address of the third party waste management facilities receiving waste or parties taking possession of the substances no longer considered as waste;

d) Name and address of waste transport contractors;

e) Planned waste treatment.

15.3. The contractor files and maintains at the disposition of the project Engineer the waste manifests for the collection, transport, treatment and/or eliminationof waste.

15.4. The waste register is established and available as of the Contractors mobilisation to any Project Area. This register will be archived for at least 1 year after the taking Over Certificate for the Works is issued.

15.5. The Contractor implements specific waste management practices adapted to the level of danger for human health or the natural environment. Three waste categories are identified for Project Areas and in tracking documents:

a) Hazardous waste: any waste with one or several dangerous propertiesas listed in appendix 2 of these ESHS Specifications;

b) Non-hazardous waste: any waste with no properties rendering it hazardous. Non-hazardous waste contaminated by hazardous material will be considered as hazardous waste, unless instructed otherwise bythe Project Engineer;

c) Inert waste: any waste unaffected by any significant physical, chemical or biological modifications, which does not decompose, burn or produce any physical or chemical reaction, is not biodegradable and does not damage any substance with which it comes into contact in a manner likely to cause damage to the environment or human health.

15.6. The Contractor assesses, document and effectively implements any local recycling or re-use options for its waste.

15.7. Waste is categorised and stored separately prior to removal from the Project Areas, depending on the level of danger, phase (liquid, solid or gas), the waste

management solution to be applied and its potential in terms of recycling or reuse.

15.8. Waste is collected from each Project Area at the same rate that it is produced and is placed in temporary locations meeting the following criteria:

a) Located at a distance of over 100 m from any natural sensitive area and over 500 m from any socioeconomic sensitive area (school, market, healthcare centre, water well or catchment area), with the exception of waste storage area in camps;

b) Protected from moving machinery and vehicles, but easy to access for regular collection;

c) Located on a flat impervious surface to prevent infiltrations.

d) Under cover for non-inert waste;

e) Stored in containers of the appropriate size, tightness and level of resistance depending on the danger and phase (solid, liquid, gas) of the waste;

f) Liquid wastes storage is equipped with secondary retention with a volume at least equal to the volume of the waste contained in the containers.

g) Hazardous waste stored pursuant to Sub-Clause 26.8 of the present ESHS Specifications.

15.9. Waste is removed from Project Areas and transported to recycling, treatment and waste management facilities on a regular basis. The frequency of removal, approved by the Project Engineer, guarantees:

a) No overflow from containers;

b) No unpleasant odour or emissions which are dangerous for human health;

c) No proliferation of insects, rodents, dogs or other animals which are harmful or dangerous for human health;

d) Regular cleaning of containers and surfaces on which they are located.

15.10. Unless otherwise specified in the Contract or instructed by the Project Engineer, waste incineration is prohibited on Project Areas.

The use of third party waste management services is subject to a documented prior audit of the treatment, storage and recycling facilities by the Contractor, to guarantee the conformity with the provisions of the present ESHS Specifications on waste.

15.11. Pursuant to Sub-Clause 1.5 of the present ESHS Specifications, the provisions applicable to the Contractor regarding waste management also apply to any third party waste management Subcontractor. The project Engineer reserves its right to inspect third party waste management facilities and prohibit the Contractor from using the facilities if considered unacceptable.

15.12. The management of non-hazardous waste complies with the following conditions:

15.12.1. Non contaminated inert waste is removed and can be disposed of tolandfill with unused backfill material. The location, capacity and environmental protection measures, particularly for water courses, implemented by the Contractor or any Subcontractor, will comply with the provisions of the present ESHS Specifications.

15.12.2. Non-hazardous waste that cannot be recycled is disposed of to landfill, complying with the following criteria:

a) Walls and base sealed by a geo-membrane or a layer of compacted clay with a permeability 10^{-7} cm/s;

b) Drained for the recovery of leachates, which are routed to a lagoon aerobic/anaerobic treatment prior to discharge into the natural environment or collected in a temporary storage prior to regular collection and transfer to a treatment unit (septic tank or wastewatertreatment plant);

c) Regularly compacted and covered by earth to limit odours and the proliferation of insects;

d) When the landfill has reached full capacity, vents are installed to evacuate gases, and the landfill covered by a geo-membrane with a minimum thickness of 1 mm, or a layer of compacted clay, and a top layer of 1.5 m of topsoil, which is revegetated.

15.13. The Contractor's hazardous waste is managed by a specialised waste Subcontractor, accredited by NEMA for this activity.

15.14. In the absence of an existing waste management solution for hazardous waste satisfying the provisions of Sub-Clause 15.3 of the present ESHS Specifications, the Contractor takes the following action:

15.14.1. Medical waste is incinerated in a specific facility constructed and accredited for this purpose. The Contractor will submit the technical specifications of the facility to the Engineer before importing or procuring the equipment.

15.14.2. Hydrocarbons, lubricants, paints, solvents and batteries are transported in drums to the capital city, or any other city where suitable waste management facilities are available. Sludge from settling tanks/ponds, septic tanks or oily water skimmers will also be managed in the same way.

15.14.3. Contaminated soils from construction/demolition and drilling muds will be treated, stabilised and disposed of to landfill. Prior approval is required from the Engineer regarding the method and site location. The Contractor obtains authorisation from the competent local authorities prior to any disposal to landfill.

15.14.4. Prior approval from the Project Engineer is required before implementing waste management solutions on any other hazardous waste.

15.14.5. Prior to the issue of the Taking over Certificate for the Works, the Contractor provides documentation on hazardous waste landfilled at

other sites than accredited third party waste management facilities. The documentation includes a plan showing the location of landfill sites. The document is provided to the competent local authorities whose jurisdiction covers the landfill sites.

16. Vegetation clearing

16.1. The Contractor describes in the Worskite ESHS methodology, the planned methods and schedule for vegetation clearing. Specific agreement from the Project Engineer is obtained prior to any clearing works.

16.1.1. Vegetation clearing using chemicals is not permitted.

16.1.2. Vegetation clearing using bulldozer is not permitted in zones less than 30 m from areas designated as sensitive by the Project Engineer, where only manual clearing is authorised.

16.1.3. Unless otherwise specified in the Contract or if otherwise instructed by the Project Engineer, burning vegetation is not permitted. Greenwaste can be burnt with prior approval from the Project Engineer regarding the location, method and schedule.

16.2. Areas cleared prior to undertaking earthworks are shown on a plan with a minimum scale of 1/10,000. Plans are submitted to the Project Engineer for validation prior to starting clearing works.

16.3. The Contractor undertakes physical demarcation of zones to be cleared usinga method approved by the Engineer.

16.4. The characteristics (location, species, and diameter at chest height) of trees not to be cut down are defined by the Engineer in coordination with the Employer. Such trees are marked with paint and protected against clearing machinery using a method approved by the Engineer.

16.5. Clearing is undertaken without damage to adjacent non-cleared areas. Topsoil is stored within the cleared areas at the edge of the cleared zone. Clearing is undertaken working from the edge of the zone inwards.

16.6. Wood with economic value

16.6.1. During clearing, the Contractor stockpiles separately: (i) tree trunks with a diameter at chest height greater than the size defined by the Project Engineer, and (ii) trunks with a smaller diameter, branches, leaves, stumps and roots.

16.6.2. Unless instructed otherwise by the Project Engineer when validating the plans of ESHS Specifications Sub-Clause 16.2 or unless specified otherwise in the Employer's country regulations, the trunks of trees exceeding the diameter defined by the Project Engineer are the property of the Contractor.

17. Biodiversity

17.1. The Contractor shall ensure that all personnel are informed and aware ofthe importance to protect fauna and flora. Information and awareness training is documented.

17.2. The Contractor shall ensure that all personnel are informed and aware of wildlife encounters procedures. Information and awareness training is documented.

17.3. The Contractor shall apply the Contracting Authority's procedures with regards to fauna and flora management prior to clearing activities.

17.4. Where possible, areas shall be cleared from one side to another, or fromthe inside out, to prevent animals becoming trapped.

17.5. The Contractor personnel shall not approach, injure, hunt, capture, possess, feed, transport, rear or trade wild animals and/or collect birds' eggs while working on the Project Areas.

17.6. The Contractor personnel shall not collect flora species while working onthe Project Areas.

17.7. The Contractor shall report any sighting or finding of dead wildlife to the Project Engineer immediately.

17.8. The Contractor shall protect excavations with temporary fencing to prevent injury to animals.

17.9. The Contractor shall release any trapped uninjured animals immediately.

17.10. The Contractor shall report injured animals to the Project Engineer.

17.11. The Contractor shall not disturb natural habitats outside the Project Areas.

17.12. The Contractor shall only use designated roads or paths and abide by speed limits.

17.13. The Contractor shall not start forest fires.

17.13.1. To limit the risk of introducing marine invasive species, the Contractor shall control the ballast water and anti-fouling systems of vessels arriving from other bioregions in accordance with International Maritime Organization (IMO) conventions and guidelines.

18. Erosion and sediment transport

18.1. The Contractor plans earthworks and optimizes the management of space to ensure that all cleared surfaces and areas exposed to soil erosion are minimised on all Project Areas.

18.2. Topsoil

18.2.1. Unless indicated otherwise by the Engineer, the top 25 centimetres of the soil will be considered as topsoil.

18.2.2. Earthworks for the temporary occupation of the Project Area are preceded by the clearing of topsoil and the storage of this soil separately from the underlying sterile soil.

18.2.3. Topsoil is stored according to the provisions approved by the Engineer to enable reuse during Project Area rehabilitation.

18.3. Draining rainwater run-off

18.3.1. The gradient of Project Areas allows the collection and drainage of rainwater from the entire surface area to one or several discharge points. No pools of water are created.

18.3.2. Suspended solids in rainwater are removed using sediment traps / settling ponds. Rainwater from vehicle parking areas, machinery areas, workshops is subject to treatment with oily water separators.

18.3.3. Rainwater pre-treatment units are sized, cleaned, maintained and accessible to ensure compliance with the effluent quality criteria defined in ESHS Specifications Sub-Clause 12.6 and to allow monitoring of performance.

18.4. Sediment control

18.4.1. The Contractor installs sediment control barriers to slow the flow ofwater and control sediment transport at Project Areas with (i) a gradient of more than 20%, and (ii) where land is disturbed by the works or where stockpiled mineral material exposed to sheet or rill erosion.

18.4.2. Sediment control barriers are installed on the slope or at the base of the slope to protect the natural drainage system from sediment accumulationat levels higher than the natural situation. These barriers comply with thefollowing principles:

a) Made with geotextiles or straw bales or any other means pre-approved by the Engineer;

b) Deployed before the start of works and removal of topsoil. Barriers can be used for the physical demarcation of working areas;

c) Installed, cleaned, maintained and replaced according to manufacturer recommendations;

d) Drainage surface area does not exceed 1,000 m² per 30 m of barrier. Thelength of the slope behind the barrier is less than 30 m, and is not used for flows in excess of 30 l/s.

18.4.3. For the dredging of marine sediments, unless specified otherwise in the Contract, or instructed otherwise by the Engineer, and particularly if the working area is exposed to currents, the Contractor will install a geotextile silt curtain, or any other technique approvedby the Engineer to control turbidity clouds.

18.5. Backfilling and stockpiling of backfill materials

18.5.1. To ensure stability and resistance to rainwater runoff erosion, mineral material stockpiles do exceed a height of 6 m, with a maximum slope of 3:2 (height: volume). The slope is crossed at a height of 3 m by a berm with a minimum width of 2 m and with a peripheral drainage trench.

18.5.2. For permanent backfill material stockpiles, the stockpile is shapedand compacted every 30 cm to ensure long-term stability.

18.5.3. Temporary stockpiles in place for more than 60 days are protected against runoff erosion by (i) revegetation using fast-growing grass species, either by direct seeding or by hydro-seeding, or (ii) using

other natural anti-erosion cover with prior approval from the Engineer.

18.6. Side casting during the construction of linear structures (roads, pipelines,transport lines), will be permitted in the following conditions:

18.6.1. For natural gradients with a slope <40%, the side cast materials are piled to create a slope of less than 2H:1V.

18.6.2. For natural gradients with a slope >40%, to ensure stability 3 m wide berms will be installed perpendicular to the slope and onto which the side cast material is deposited. Regular earthworks to maintain the form of the side case and long term stability of the side cast is carried out. The slope of the side cast in general does not exceed 3H:2V.

18.6.3. The provisions of Clauses 10 and 18.4 for the protection of water courses exposed to erosion induced by the works apply.

19.Site rehabilitation

19.1. Unless instructed otherwise by the Project Engineer, the Contractor will rehabilitate all Project Areas disturbed by the works, prior to the provisional acceptance of the works.

19.2. All buildings and free standing and underground structures (e.g. piping, underground tanks, sumps and basins) shall be removed. All waste and rubble is removed in accordance to the provisions of Clause 15 of the present ESHS Specifications. After removal of buildings structures and rubble, the Contractor returns Project Areas to their original condition, according to the following provisions.

19.2.1. Land is levelled to ensure that run-off water drains without eroding soil or stagnating in pools. Unless instructed otherwise by the Engineer, the gradients of restored sites (excluding backfill as defined in Sub- Clause 18.5 of the present ESHS Specifications) must be as for the adjacent undisturbed land.

19.2.2. Rehabilitated Project Areas do not represent hazards for people. Areas near steep drops at quarries are indicated with permanent concrete signs.Holes are refilled. Sharp or unstable items are rendered inoffensive.

19.2.3. Unless specified otherwise in the Contract, or instructed otherwise by the Engineer, the Contractor undertakes revegetation of all Project Areas disturbed by the works and bears the cost of such work.

19.2.4. Topsoil set aside during initial earthworks pursuant to ESHS Specifications Sub-Clause 18.2, is evenly spread over areas which have been levelled or where ruts have been cut into compacted areas. The surface of compacted soils on Project Areas is loosened by scouring (using rakes or other acceptable methods).

19.2.5. Revegetation is undertaken throughout the duration of construction works, and is not limited to the rehabilitation of Project Areas at completion of the works.

19.3. The present Clause 19 applies to the side casting of waste mineral materials generated during the construction of linear structures (roads, pipelines, transportlines).

20. Documentation on site conditions

20.1. The Constructor documents changes in condition of all Project Areas from the start of works until the Performance Certificate is issued. Documentation comprises dated and geo-referenced colour photographs taken from a constant angle and viewpoint.

20.2. The Project Area condition is documented as a minimum for the followingstages:

a) Before any Project Area disturbance at the start of works;

b) On completion of works, but prior to starting rehabilitation;

c) On completion of rehabilitation and revegetation (where applicable), ifnecessary, but prior to the Taking Over Certificate issuing;

d) After the end of the Defects Notification Period and prior to the Performance Certificate issuing.

D. Health and Safety

21. Health and safety plan

21.1 The Contractor describes the Health and safety plan for the Worksite ESHS activities, its organisations for managing health and safety, pursuant to its Health and Safety Management system and meeting OSHA regulations.

21.2 The plan identifies and specifies:

a) All health and safety risks relating to the execution of the works, by also identifying gender-specific risks;

b) Prevention and protection measures to control risks related to the execution of the works, by differentiating, where necessary, measures concerning the protection of women and men;

c) Human and material resources involved;

d) Works requiring work permits; and

e) Emergency plans to be implemented in the case of an accident.

21.3 The Contractor implements prevention, protection and monitoring measures, as described in the health and safety plan.

22. Daily and weekly meetings

22.1. The Contractor organises as a minimum one health and safety meeting per Project Area per week (or at another frequency approved by the Project Engineer) with allthe personnel assigned to the Project Area. This applies only to Project Areas wherework is ongoing. At the meeting accidents and incidents that occurred in the previous week are discussed and feedback provided. Means of improvements are identified, documented and assessed to establish corrective actions. The Engineer is invited to participate at all health and safety meetings. Meeting reports are provided to the Project Engineer.

22.2. The Contractor organises daily (or at another frequency approved by the Project Engineer) health and safety meetings at all Project Areas, per shift and per team, prior to the start of the daily work. The meeting establishes the health and safety risks associated with the day's tasks and activities, and means of prevention and protection to be implemented. Minutes of the meetings shall be recorded.

23. Equipment and operating standards

23.1. The facilities and equipment used by the Contractor are installed, maintained, revised, inspected and tested pursuant to the manufacturer's recommendations.

23.2. The Contractor lists and describes in the Worksite ESHS methodology the national and international standards, guidelines and industry codes of practice, applied during the execution of works.

23.3. Separate toilets and locker rooms shall be provided for women and men.

24. Work permit

24.1. The Contractor puts in place a work permit procedure to manage risks through theimplementation of prevention and protection measures prior to the starting of work.The procedures define the approval process between the person qualified to issue the work permit and the personnel (or Subcontractors) carrying out the work.

24.2. Permits are issued in writing. Unless specified otherwise in the Contract, or instructed otherwise by the Project Engineer, works which require a work permit

are defined in the health and safety plan. All other work permits required by the Project Engineer will be implemented by the Contractor.

25. Personal protective equipment

25.1. The Contractor ensures that all personnel, visitors or third parties entering a ProjectArea are equipped with Personal Protection Equipment (PPE) pursuant to the practices and standards specified in Clause 9.

25.2. Where appropriate, PPE must be worn by women as well as by men.

25.3. Personnel and visitors to Project Areas are equipped with a safety helmet, safety shoes and a reflective jacket as a minimum.

25.4. Adequate quantities of PPE are available on the Project Areas. Storage conditions must be compatible with usage pursuant to the provisions of ESHS Specifications Sub-Clause 24.1.

25.5. Contractor personnel are trained in how to use and care for PPE and the Engineer has access to training certificates.

26. Dangerous substances

26.1. A substance is considered dangerous if one or several of its properties render it dangerous, as defined in Appendix 2 of the present ESHS Specifications. The Contractor identifies and manages dangerous substances planned for use on the Project Area in the manner described in the present Clause 26.

26.2. The assessment of the impact of the toxicity of dangerous substances on the reproductive functions of women and men must be taken into account.

26.3. The transport to the Project Area and use of dangerous substances requires prior authorisation from the Engineer.

26.4. Details of risks and related prevention and protection measures are included in thehealth and safety plan.

26.5. The Contractor obtains all necessary authorisations and/or licenses for the storage and use of dangerous substances from local authorities. A copy of the authorisations is provided to the Engineer.

26.6. For each dangerous substance used, the Contractor will implement the recommendations described (i) in the Material Safety Data Sheets (MSDS), and (ii) by the Globally Harmonized System of Classification and Labelling of Chemicals established by the United Nations for hazardous chemicals.

26.7. Copies of MSDSs are kept on the Project Area, and made available to personnel. The Contractor provides the Engineer with copies of all MSDSs.

26.8. Storage of dangerous substances

26.8.1. Storage area are designed and equipped by the Contractor based on the chemical and physical properties of the substances, on the types of containers stored, the number of people requiring access, the ventilation requirements, the quantities of the substance used and potential chemical reaction with other substances (see ESHS Specifications Sub-Clause 26.8.5).

26.8.2. Pursuant to ESHS Specifications Sub-Clause 15.5, the Contractor anticipates and plans for the storage and management of hazardous waste.

26.8.3. Storage areas for dangerous substances are subject to strict rules, which are regularly checked by the ESHS supervisor appointed pursuant to ESHS Specifications Sub-Clause 4.1.4. The rules include the following as a minimum:

a) Access to the storage area is limited to trained and authorised individuals;

b) An inventory is maintained up-to-date;

c) MSDSs must be available for all stored dangerous substances, and the substances must be clearly labelled;

d) A strict and methodical storage system is implemented (storage plan posted, large or heavy packaging may not be stored at heights, equipment and tools may not be stored in the dangerous substance storage room);

e) Compliance with product expiry dates and implementation of a disposal procedure for substances which are not needed or which have expired;

f) Entrances, exits and access to emergency equipment are kept clear at all times.

26.8.4. Storage areas are clearly identified with warning signs at the entrance. TheContractor displays the storage plan (location of the different products, maximum inventory), a summary of labelling system and information on chemical incompatibilities.

26.8.5. Chemicals which could react together (leading to explosions, fire, projections or the emission of dangerous gases) are physically separated.

26.8.6. Products that react violently with water are stored so as to prevent contactwith water, even in the event of flooding.

26.8.7. Inflammable products are stored separately in a dedicated area with adequate ventilation at all times.

26.8.8. Buildings used to store large quantities of dangerous substances are isolated from other buildings to avoid the spreading of fire. Such buildingsare constructed using solid and non-combustible building materials, and are equipped with evacuation systems and the appropriate firefighting equipment. Access to the buildings is clear, allowing for rapid evacuationin the event of an accident. The electrical systems are reduced to the essential minimum, and access points are equipped with adequate lighting(300 lux).

26.8.9. All storage areas are equipped with secondary retentions. Each storage area acts as a general secondary retention. Suitable absorbents (neutralising and non-combustible) are available in the storage area to clean up any spills and leaks.

26.8.10. The Contractor maintains the storage area at a suitable temperature for dangerous substances to prevent

overpressure and bursting of containers.

27. Planning for emergency situations

27.1. The emergency plan required in application of ESHS Specifications Sub- Clause 21.2 covers the following emergency situations as a minimum:

a) Fire or explosion;

b) Structural failure;

c) Loss of the containment of dangerous substances;

d) Safety incident or malicious act.

27.2. The Contractor shall details the emergency plan in the ESHS methodology .

27.3. The Contractor ensures that all personnel are informed and aware of how to reactin an emergency situation, and responsibilities are defined. Information and awareness training is documented, and available on all Project Areas.

27.4. The Contractor organises and documents emergency simulation exercises within 3 months of the physical start of the works, and subsequently once every 12 months up to the issue of the Taking-Over Certificate. The Engineer is invited toparticipate in each of these exercises.

27.5. Fire extinguishers are made available in each building at clearly identified locations, and fires are strictly forbidden outside of the cooking area.

28. Medical check-ups

28.1. The Contractor organises medical check-ups for all Contractor's Personnel/employees prior to the initial mobilisation to the Project to check on covid-19 health status of each worker and aptitude to the work. Medical check-ups are adapted to the anticipated occupied positions and carried out pursuant tothe recommendations of the GOK health agencies. Subsequent to the check-up,a written medical certificate is issued declaring the aptitude of the worker for the allocated tasks.

28.2. The Engineer can request additional medical examinations for the Contractor's Personnel if considered necessary, all costs to be borne by the Contractor.

28.3. A medical examination is carried out on any Contractor's Personnel returning to work after leave caused by a work related accident. A written medical certificateis issued confirming the Contractor's Personnel's aptitude to return to work at thedesignated workstation.

28.4. The Contractor can produce a copy of its Contractor's Personnel's work aptitudecertificates at the request of the Project Engineer or any competent authority.

28.5. Specific arrangements for tasks' assignments or workstations shall be made for pregnant Personnel.

29. First aid

29.1. The Contractor ensures that at least one first aid personnel is present at all times during working hours.

29.2. The Contractor equips the Project Area with a communication system exclusively for the purposes of communication with the first aid services. Information on how to communicate with the first aid services is clearly indicated near the communications equipment.

30. Health care centre and

30.1. For Project Areas with more than 35 workers present at any one time and whereit is not possible to reach a hospital, medical clinic or the Contractor's health

medical personnel at site (Not applicable)

centre within a period of 45 minutes, by land and in normal conditions (Not applicable).

30.1.1. The Contractor sets up a health care centre at its own cost. This centre is (Notapplicable):

a) Operational and easy to access at all times;
b) Kept clean and in good condition;
c) Equipped with appropriate heating or air-conditioning;
d) Equipped with sanitary facilities and drinking water;
e) Equipped with instruments, equipment, medicines and material required to examine and treat injured or sick workers in emergency conditions;
f) Equipped with the supplies and furnishing required to allow medical personnel to provide first aid and fulfil their other functions.

30.1.2. A doctor is on-site at all times, working full-time during normal day-shift hours. The doctor is on-call when more than 20 workers are working simultaneously outside of normal day-shift hours.

30.1.3. The doctor has the following profile:

a) At least 5 years' experience on large-scale construction works atsites located at a distance from a hospital;

b) Trained in infectious diseases, waterborne and epidemiological diseases prevalent in the Employer's country;

c) Able to lead training sessions on occupational health and first aid;

d) Trained in management and logistics for a remote health carecentre;

e) Able to speak the same working language used by most membersof personnel fluently (communication in emergency situations);

f) In good physical condition, able to access remote working areas.

30.1.4. The Contractor allocates a road or air vehicle for first aid purposes to the first aid station pursuant to standard NF EN 1789:2007.

30.1.5. The Contractor ensures the presence of at least one nurse to assist the doctor per shift with 200-800 workers allocated, and one extra nurse for each additional 600 workers allocated to this shift. Over and above 500 workers per shift, the Contractor ensures the presence of an extra doctor for each additional 500 workers allocated to this shift.

31. First aid kits

31.1 The Contractor equips each Project Area with an adequate number of first aid kits to ensure that all workers can access these kits in approximately 5 minutes. Kits must be available at all times.

31.2 Each vehicle is equipped with a first aid kit.

31.3 First aid equipment and kits comply with attached specifications.

32. Emergency medical evacuations

32.1. The Contractor establishes, and provides the Project Engineer within one month of the physical start of works a copy of an agreement with a specialised company for the handling of personnel in the event of a serious accident requiring an emergency medical evacuation, which cannot be organised using the first aid vehicle without endangering the life of the patient.

32.2. The agreement includes a convention with a referring hospital where the memberof personnel evacuated in emergency conditions will be treated.

32.3. The agreement covers the use of air transportation in order to evacuate the injuredpatient(s) to the referring hospital.

33. Access to health care

33.1. The Contractor guarantees access to health care as defined in Clause 30 for all personnel in case of accident or illness occurring during the execution of the works, i.e.:

a) Medical check-ups for COVID-19: initial (recruitment), annual and upon returning to work after sick leave;

b) Screening, vaccinations and preventive healthcare (whereapplicable);

c) General healthcare during the execution of the works;

d) Medical assistance in the event of an accident and assistance foremergency evacuations.

33.2. Subcontractor's personnel, other contractors, the Employer or the Engineer, present at the Project Area, must never be refused medical assistance, under the pretext that they are not directly employed by the Contractor. The Contractor mayhowever define a unit rate cost per medical act for personnel, other than its own Contractor's Personnel, display this rate in the healthcare centre and forward theinformation to the Engineer.

33.3. In the event of accident or serious illness, medical personnel must be trained, available and equipped with the necessary material, medicines and consumables to provide first aid for the patient, stabilize their condition, until the patient is:

a) Either treated or discharged; or

b) Hospitalized in county Level 5 or equivalent private hospital; or

c) Evacuated to a medical centre which is well equipped for intensivecare, if necessary.

34. Health monitoring

34.1. The Contractor cannot recruit workers in poor health.

34.2. The initial pre-recruitment examination must confirm that applicants carry no infectious diseases and are physically able to carry out the tasks required for the position.

34.3. The detection of pregnancy during the initial pre-recruitment examination of female applicants shall not constitute grounds for declining recruitment, unless medical risk is proven.

34.4. The Contractor organises annual medical check-ups for its Contractor's Personnel and keeps up to date a medical record for each Contractor's Personnel. The presence of Contractor's Personnel for medical check-ups, treatment and hospitalization is incorporated into the Contractors planning.

34.5. The Contractor provides the Contractor's Personnel with prophylaxis and vaccinations against local diseases and vectors. In particular, the Contractor will promote the use of impregnated mosquito nets by its Contractor's Personnel in camps or offsite lodging, and distributes these nets appropriately.

34.6. The health and safety plan includes a Contractor's Personnel health risk assessment based on exposure to dangerous substances and describes the medicalmonitoring implemented.

35. Sanitary repatriation

35.1. The Contractor is responsible for the sanitary repatriation of Contractor's Personnel in the event of a serious injury or illness. The Contractor will take out the necessary insurance to cover the cost of the sanitary repatriation of its Contractor's Personnel.

36. Hygiene, accommodation and food

36.1. Drinking water

36.1.1. The Contractor provides personnel with drinking water at all Project Areas. The quantity and quality of this water complies with the standards of the World Health Organization at supply points.

36.1.2. Unless the supply of drinking water is provided by a certified supplier, the quality of the drinking water provided to workers is tested at least at the start of the works and then on a monthly basis. The protocol for takingand analyzing samples is based on the recommendations of the Public health regulations. The results shall be documented and made available on the Project Areas.

36.2. Accommodation conditions (where applicable)

36.2.1. The accommodation provided for non-resident Personnel in a camp or analternative structure outside of the Project Areas, such as a hotel or rented house, will comply with the conditions of the present ESHS Specifications Sub-Clause 36.2

36.2.2. Unless specified otherwise in the Contract, or instructed otherwise by theProject Engineer, Personnel are housed in rooms. Rooms do not host morethan 4 individuals, with no bunk beds, and with 0.5 m3 of storage space available per person.

36.2.3. Rooms shall not be mixed: separate rooms must be made available for both men and women.

36.2.4. Rooms are lit and equipped with power sockets, beds and windows fitted with mosquito nets. Flooring is of a hard and impervious material.

36.2.5. The temperature in rooms and common areas shall be kept at an appropriate level during occupied hours.

36.2.6. Night-time noise levels to which personnel are exposed comply with the limits recommended by the World Health Organization.

36.2.7. The Contractor provides one drinking water tap per 10 Contractor's Personnel, one shower per 10 Contractor's Personnel as a minimum, one individual toilet for 15 Contractor's Personnel as a minimum, and one urinal per 25 Contractor's Personnel at accommodation camps. Separate showers and toilets must be made available for women.

36.2.8. The Contractor constructs and maintains a shared leisure area in each camp and a sports field (used for football and basketball as a minimum) for use by Personnel.

36.3. Hygiene in shared areas

36.3.1. Sanitary areas (showers, sinks, urinals, toilets) are cleaned and disinfectedby the Contractor's cleaning service at least once every 24 hours. Cleaning operations are documented.

36.3.2. The canteen, kitchen and kitchen utensils are cleaned after each meal service.

36.3.3. The number and location of toilets on Project Areas shall be adapted to the number of employees and the configuration of the Project Areas (distance, isolated area, etc.).

36.4. Food

36.4.1. The Contractor may where required in the contract provide meals at a reasonable cost to its Contractor's Personnel per shift at site or at canteenarea and according to a procurement system which complies with the provisions of this ESHS Specifications Sub-Clause 36.4.

36.4.2. The Contractor defines and implements actions in order to guarantee (i) the quality and quantities of food stuffs, (ii) compliance with health ruleswhen preparing meals, (iii) fitting out and servicing premises and equipment, both in the kitchen and food storage areas.

36.4.3. The Contractor inspects the cleanliness of food transport vehicles, temperature control and the cold chain, as well as best-before dates, and takes the necessary corrective actions. The temperatures of chillers are regularly checked.

36.4.4. The Contractor checks that health requirements are met for food storage conditions in the kitchen or other locations, food cooking times and temperatures, and the conditions in which prepared products are left prior to consumption, to ensure no health risks. Prepared food is eaten or thrown away, no food remains are reused.

36.4.5. The Contractor recruits trained canteen personnel and ensures that supervisors monitor compliance with sanitary instructions. The Contractor ensures that canteen

personnel have means of ensuring compliance with health rules (changing rooms, linen, hand washers, the condition of flooring and paint, and the existence of a cleaning plan).

36.5. At the request of the Engineer, the doctor at the health centre specified in Sub- Clause 30.1.2 of the present ESHS Specifications, carries out an audit on all Project Areas every 3 months, and documents the results, and includes the

conditions of hygiene in which meals are prepared and food conserved. The results of this audit are provided to the Engineer.

36.6. The Contractor, on the basis of the advice of the doctor at the health centre, informs Contractor's Personnel on appropriate behaviour in terms of workplace hygiene. The occasional distribution of information is not sufficient, the Contractor regularly reiterates the importance of hygiene, documents these reminders, and ensures that the information is understood, easy to apply and scrupulously complied with.

37. Substance abuse

37.1. The use, possession, distribution or sale of illegal drugs, controlled substances (as per local regulations) and alcohol is totally prohibited on the Project Areas. The Contractor implements a zero tolerance policy for the consumption of these substances.

37.2. Any person suspected by the Engineer to be under the influence of alcohol or controlled substances on any Project Area is immediately suspended from his position by the Contractor, pending the results of medical tests.

E. Local labour and relations with local communities

38. Labour conditions

38.1. The Contractor should ensure decent labour conditions for workers and notably compliance with applicable Labour law and regulations of Kenya in implementation of the contract, and with the fundamental conventions of the International Labour Organisation (ILO). This includes workers' rights related to wages, working hours, rest and leave, overtime, minimum age, regular payment, compensation and benefits. The Contractor should respect and facilitate workers' rights to organise and provide a grievance mechanism for all direct and indirect workers. The Contractor should implement non-discrimination and equal opportunity practices, and ensure prohibition of child or forced labour,

39. Local recruitment

39.1. Local recruitment is defined as the number of positions actually allocated to people residing in the region of the Works (less than two hours by land transportto the Project Area) for more than one year and citizen of the Employer's country.

39.2. The Contractor implements a voluntary local recruitment policy for its personnel for the duration of the Works and shall enforce this policy to its Subcontractors.

39.3. The Contractor demonstrates the effective implementation of this voluntary policy to the Project Engineer in its monthly activity report as defined in Sub-Clause 6.2 of the present ESHS Specifications.

39.4. Pursuant to Clause 8 of the present ESHS Specifications, the Contractor develops a training programme aiming to support the voluntary local recruitment policy.

39.5. This training programme must be available to women and adjusted to their levelof education.

39.6. An incentive mechanism to increase the share of women recruited by theContractor and the Subcontractors may be established.

39.7. Local labour needs are estimated prior to the start of works and described inthe Worskite ESHS report with the following information:

a) Identification of positions that could be filled by local staff and the level of qualification required;

b) Definition of the planned procedure for the effective recruitmentof these members of staff;

c) Establishment of mechanisms to ensure non-discrimination ofwomen in accessing recruitment procedures;

d) Deployment schedule for these positions in consultation withlocal leaders and Project engineer;

e) Initial training to be provided by the Contractor for work description.

39.8. In order to prevent outsiders from entering the Project Area, local recruitmentat the Project Area, including at the entrance, is prohibited.

39.9. Local recruitment office

39.9.1. Week prior to the start of Works, the Contractor establishes a local recruitment consultation with local leaders in the area where the mainProject is located.

39.9.2. A representative of the Contractor and Local leader representative shall work together during this process. Recruitment report shall be submitted to project engineer.

39.9.3. The contractor shall provide information on job vacancies with the (required qualifications, duration, and location) and on the information to be provided in the applications.

39.9.4. Lists of local candidates are drafted by the local leader representative together with the Contractor's Humans Resources manager personnelfor consideration.

39.10. The Contractor's Human Resources personnel selects candidates listed by the local recruitment office at site based on requirements for the Works and the Contractor's recruitment procedures. A written contract between the Contractor and the local Contractor's Personnel is drafted, signed and archived by the Contractor.

39.11. If the Project Areas are located near to several different communities, the Human Resources personnel ensures a fair distribution of local recruitmentbetween the different communities.

39.12. The Human Resources personnel will ensure that recruitment campaigns in local communities have been spread to women and that the latter have not beendiscriminated in recruitments.

39.13. The Contractor maintains one record per local Contractor's Personnel indicating the hours worked per person allocated to the works, the type of tasks carried out, the wages paid and any training provided. Records are available atthe main Project Area at all times, so the Project Engineer and the authorised representatives of the government agencies can assess the contents.

40. Transport & accommodation

40.1. If specified in the Contract, or instructed otherwise by the Project Engineer, the Contractor provides or enables access to daily transport for Contractor's Personnelnot housed in the camps managed by the Contractor and living more than 15 minutes' walk from the Project Area and less than one hour by land transport.

40.2. The transport is organised under conditions which comply with local regulations and which ensure the safety of the people transported.

40.3. The Contractor organises collective transport: pick-up times and locations are defined and services organised appropriately.

40.4. If the Project Area is moved during the working season and if the Contractor retains the local personnel trained at the start of the works, the accommodationof the Contractor's Personnel is managed by the Contractor:

a) Within a mobile camp with the other non-local Contractor's Personnel; or

b) In villages located near to the mobile Project Area, in this case, each local Contractor's Personnel will receive a housing allowance in addition to his wages.

41. Meals (where applicable)

41.1. Food supplies for the meals of the Contractor personnel will exclude any meat obtained from hunting or poaching, with the exception of fish.

41.2. The Contractor provides at least two meals per shift to local Contractor's Personnel pursuant to the hygiene conditions specified in Clause 36 of the present ESHS Specifications, at reasonable price for the Contractor's Personnel.

42. Damage to people and property

42.1. The Contractor shall not disturb or interfere with the inhabitants of local communities close to or in the Project Area, and shall respect their houses, cultures, animals, properties, customs and practices.

42.2. The Contractor is responsible for damages to people and property caused by the execution of the works or the procedures used for execution.

42.3. Access to the Project Areas is prohibited to unauthorized persons. The Contractor is responsible for the security and access control of the Project Areas.

42.4. The Project Engineer is informed of any damage caused to people, or the property of individuals, other than the Contractor's personnel, within 6 hoursof the event, regardless of the value of the prejudice.

42.5. Housing existing before the start of the works, located within a minimum radius of 800 m around the perimeter of the quarries and within a minimum radius of500 m around the other Project Areas that will be subject to blasting, will be examined by a bailiff unless agreed upon otherwise with the Project Engineer.

42.6. The bailiff's sworn statement is prepared and provided to the Engineer with the EPP.

42.7. Should any problems be detected due to the intensity of blasting, the Engineer is entitled to request that the Contractor carry out seismic measurements of theintensity of the vibrations induced by the blasting, at variable distances from the blasting points, under the supervision of the Engineer, and at the cost of theContractor.

43. Land acquisition andland take

43.1. The Contractor will cover (i) occupancy indemnities for the extraction or use of construction materials and (ii) the cost of acquiring the necessary land to stockpile excess backfill material.

43.2. The Contractor provides compensation for any prejudice suffered by the owners of the land mentioned in Sub-Clause 43.1 of the present ESHS Specifications, but also for any prejudice incurred by users of this land, if these users are not the same parties as the owners.

43.3. The Contractor demonstrates to the Project Engineer (i) who are the owner and the users, if different parties have been identified, and (ii) a written agreement governing the temporary occupancy or acquisition of this land has been negotiated and duly paid up to the two parties, if different.

44. Traffic

44.1. The Contractor defines the characteristics of its fleet of vehicles and site machinery in the Worskite - ESHS in the form of a traffic management plan.

44.2. The Contractor defines in the traffic management plan the itineraries used on amap for each route between the different Project Areas and for each phase of the construction works, and obtains the validation of the Engineer. The Contractor requests that the Employer obtain the authorisations of the competent administrative authorities if public roads are used. Any Engineer's instruction to update the traffic management plan shall be implemented.

44.3. Within one month of the physical start of works, the Contractor informs the administrative authorities of areas crossed by the Contractor's vehicles, of the itinerary and characteristics (frequency of passing, size and weight of trucks, materials carried) of the Contractor's fleet of vehicles.

44.4. If public roads are used, and unless approved otherwise by the Project Engineer, the Contractor mandates a bailiff to make a sworn report regarding the state ofthe road prior to use by the Contractor's vehicles.

44.5. The Contractor describes in the traffic management plan the expected traffic created by its fleet of vehicles (frequency of trips between Project Areas, working hours, convoys).

44.6. The Contractor also describes the number and positioning of flagmen.

44.7. Unless specified otherwise in the Contract or instructed otherwise by the Project Engineer, heavy vehicles (i.e. with a GVWR of more than 3.5 tons) may not be used at night between 22:00 and 06:00.

44.8. Speed limits

44.8.1. The Contractor takes action to limit and check the speed of all vehicles and machinery used to execute the works.

44.8.2. The maximum speed of all machinery and vehicles of the Contractor comply with the lowest of the following: the speed limit defined according to the Employer's country regulations or the following limits.

a) 10 km/h within the Project Areas;

b) 30 km/h in villages or hamlets, in towns, from 100m before thefirst house;

c) 80 km/h on unpaved roads outside of towns, villages, hamlets andcamps.

44.8.3. In coordination with the competent Employer's country authorities, the Contractor provides and installs signs for the fleet of vehicles along public roads, when public signs are inadequate.

44.8.4. The Contractor provides each of its drivers with a map at the appropriate scale of the roads authorised for the execution of the works, clearly indicating the maximum speeds authorised, and ensures their understanding.

44.9. It is strictly prohibited to transport people, equipment or products other than those required for the Works and the management of Project Areas, on board any of the Contractor's vehicles. This provision also applies to the transport oflive animals and meat obtained from hunting, fishing or poaching.

44.10. The trailers and skips used to carry materials which could be projected (sand, crushed material, aggregates, selected materials) are covered with a tarpaulin for the entire itinerary between two Project Areas.

44.11. The Contractor carries out regular inspections along the roads used by its fleet of vehicles to ensure compliance with the provisions of Clauses 44.7 to 44.10 of the present ESHS Specifications. The Contractor records these inspections and the results and transmits a summary of checks carried out for the previous month to the Project Engineer on a monthly basis.

Annex 1: Contents of Worksite - ESMP

1.	**Environmental policy**	➢ Declaration of ESHS policy signed by the Contractor clearly defining the commitment of the Contractor in terms of (i) ESHS management for its construction sites and (ii) compliance with the ESHS Specifications of the Contract.
2.	**Worskite - ESMP**	➢ Target and content of the Worskite Environmental and Social Management Plan ➢ Preparation and updating schedule

- Quality assurance and validation

3. ESHS resources

- Human resources:
  - ESHS supervisors
- Logistics & communications:
- Reporting :
  - Weekly inspections
  - Monthly
  - Accident/ Incident

4. ESHS regulations

- Definition of standards for the applicable national ESHS regulations and the ESHS recommendations of institutions affiliated to the United Nations (WHO, ILO, IMO, IFC), applicable to the execution of works:
  - Discharge standards
  - Minimum wage
  - Day and/or night traffic restrictions
  - Other
- Definition of ESHS standards for the industry applied

5. ESHS operational inspection resources

- Site tracking procedure:
  - Frequency
  - Personnel
  - Assessment criteria
- Non-conformity handling and detection procedure:
  - Distribution of information
  - Notification depending on the level of importance allocated tonon-conformities
  - Tracking of the closing of the non-conformity
- Management of data on tracking and non-conformities :
  - Archiving
  - Use as a performance indicator

6. Project Areas

- Description of Project Areas (as per definition in ESHS Specifications Sub-Clause 1.3) :
  - Number
  - Location on a topographical map
  - Activities
  - Opening & closing schedule
  - Access
- Reference to the Appendix: an Environment Protection Plan (EPP) for each Project Area.

7. Health andsafety plan

- Identification and characterisation of health and safety risks, including the exposure of personnel to chemicals, biological hazards and radiation.
- Description of working methods to minimise hazards and control risks.
- List of the types of work for which a work permit is required
- Personal protection equipment
- Presentation of the medical facilities at Project Areas:
  - Healthcare centre, medical equipment and allocation of medical staff
  - Medical acts that can be carried out on-site
  - Ambulance, communications
  - Referring hospital
- Evacuation procedure for medical emergencies

		➢ Description of the internal organisation and action to be taken in the event of an accident or incident
8.	**Training plan**	➢ Basic training for non-qualified staff ➢ Health & safety training
9.	**Labour Conditions**	➢ Description of Human Resource Policy for construction works of direct and indirect workers
10.	**Local Recruitment**	➢ Local labour requirements: – Job descriptions and the levels of qualifications required – Recruitment procedure and deployment schedule – Initial training to be provided by the Contractor for each job description ➢ Location and management of the local recruitment office(s)
11.	**Project machinery andvehicle traffic**	➢ Description of the fleet of vehicles/machinery used for the execution of the works ➢ Deployment (Project Area & schedule) and maintenance sites for each vehicle andmachine ➢ Mapping of itineraries, travel times, and areas where speeds are limited ➢ Dust suppression: – Mapping or road sections where dust reduction initiatives apply – Water points identified or to be created for refueling tanker trucks – Capacity of the tanker trucks used and calculation of the number of trucks required – Width of the track to determine if one watering run or equivalent is adequate(narrow track) or if two runs are required (wide track) – Number of watering or equivalent operations proposed per day depending on the climate
12.	**Dangerousproducts**	➢ Inventory of dangerous products per Project Area and per period ➢ Transport and storage conditions and chemical incompatibility
13.	**Effluents**	➢ Characterisation of effluents discharged to the receiving environment ➢ Facilities for the treatment or pre-treatment of effluents ➢ Measures for reducing the sediment content of rainwater runoff ➢ Measures for monitoring the efficiency and performance of facilities for reducing sediment content of rainwater runoff ➢ Resources and methods for monitoring effluent and rainwater runoff quality
14.	**Noise and vibrations**	➢ Estimation of the frequencies, duration, days of the week and noise levels per Project Area
15.	**Waste**	➢ Inventory of waste per Project Area and per period ➢ Collection, intermediate storage, handling and treatment methods for ordinary or inertwaste ➢ Storage and handling methods for dangerous waste
16.	**Clearing and revegetation**	➢ Methods & schedule for clearing vegetation and earthwork activities ➢ Methods, species and schedule for the revegetation of Project Areas disturbed by theworks
17.	**Biodiversity**	➢ Schedule for adequate fauna and flora management ➢ Measures for minimizing impact on fauna and flora species based on the ContractingAuthority procedures ➢ Measures for monitoring the efficiency and performance of the plan in place ➢ Measures for limiting IAS ➢ Measures for monitoring the efficiency and performance of the plan in place
18.	**Prevention oferosion**	➢ Location of zones suffering from erosion ➢ Methods and schedule for the implementation of anti-erosive actions, including topsoilstorage

19. Documentation of site condition

- List and cover of viewpoints
- Imaging method
- Archiving photographs

20. Rehabilitation

- Method and schedule for Project Area rehabilitation

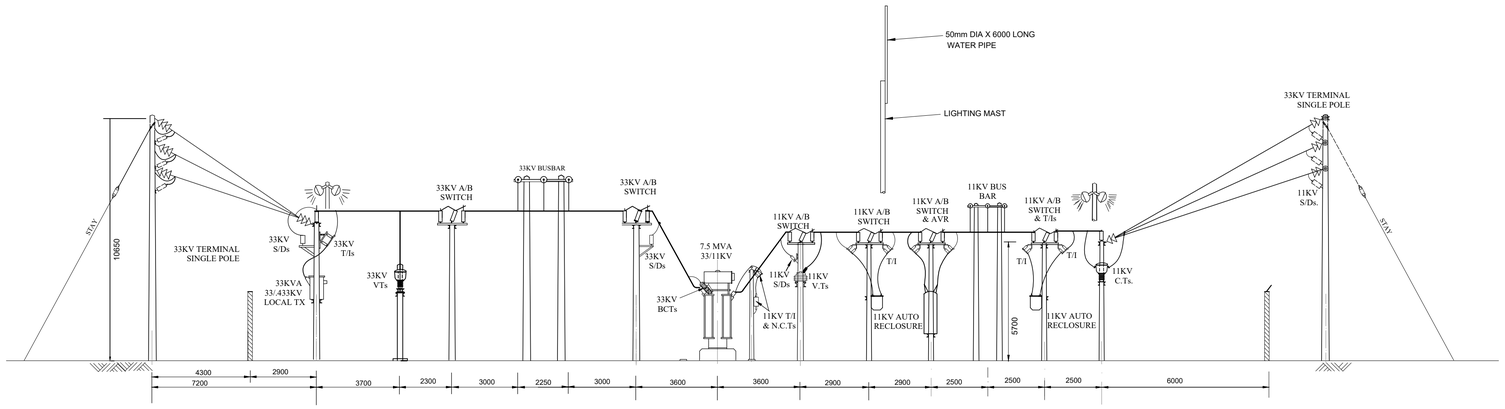
21. Appendices

- Environment Protection Plans (number and location specified in Section 6 "ProjectAreas" above):
  - Marking out of the Project Area perimeter on a map
  - Definition of zones for vegetation clearing, zones for the storage of usable timber,zones for burning of green waste
  - Definition of on-site activities: construction, storage areas, accommodation areas, offices, workshops, concrete making units
  - Layout of activity areas on the Project Area: construction works,production/operation areas, rehabilitation and closure
  - Zones for the storage of topsoil, spoil from earthworks, materials
  - Access routes and checkpoints
  - Project Area occupancy schedule
  - Organisation of Project Area preparation
  - Liquid discharge outlet points
  - Proposed sampling points for monitoring water quality
  - Atmospheric emission outlet points
  - Location of the storage site for dangerous products
  - Location and mapping of waste treatment facilities when handled by an externalservice provider
  - Any other information relating to the environmental management of the Project Area
- Emergency plan
  - Description of facilities
  - Characterisation of hazards
  - Emergency situations
  - Organisation structure - roles and responsibilities
  - Emergency procedures
  - Human and material resources
  - Triggering of the plan
  - Reporting

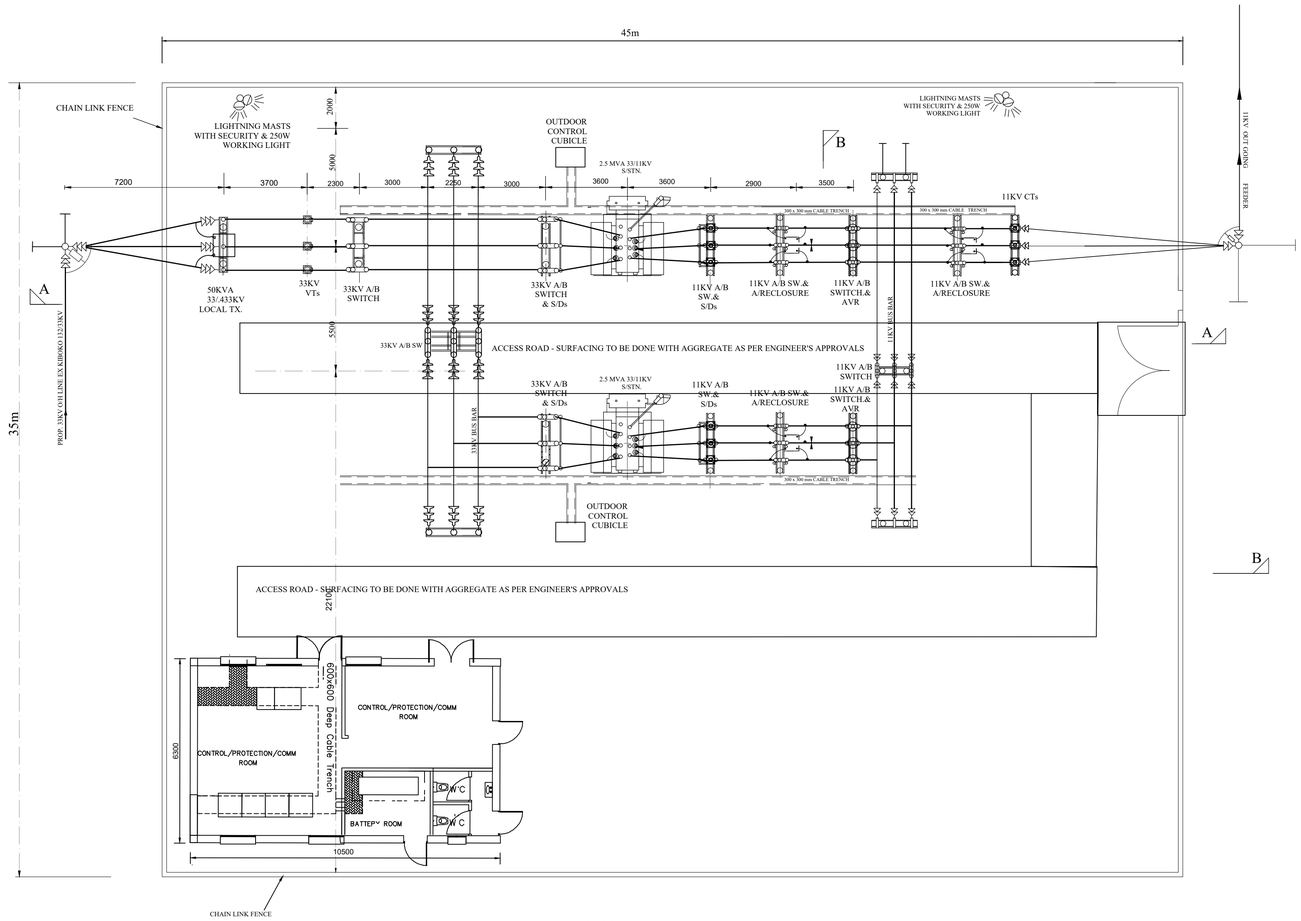
Annex 2- Properties rendering a product dangerous[1]

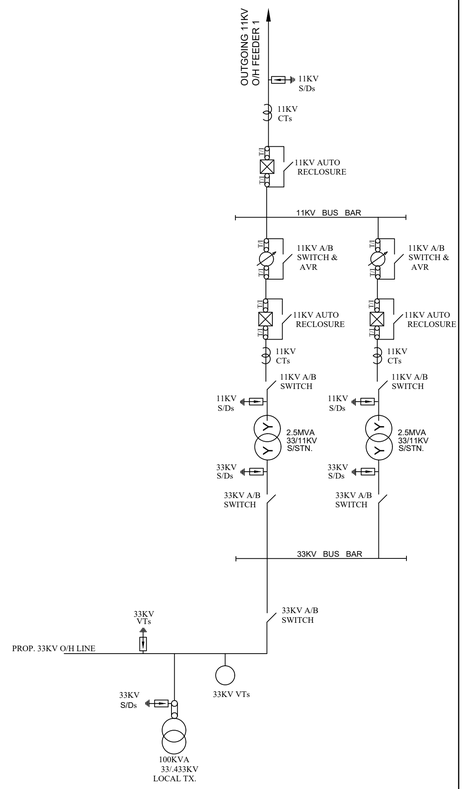
1.	**Explosive**	Substances and preparations which could explode in the presence of a flame or which are more sensitive to impacts and friction than dinitrobenzene.
2.	**Combustive**	Substances and preparations which, when in contact with other substances, particularly inflammable substances, undergo strongly exothermic reactions.
3.	**Easily inflammable**	substances and preparations (i) in liquid phase (including extremely inflammable liquids), witha flash point below 21°C, or which can heat up to the extent of spontaneous combustion in ambient air; or (ii) in solid phase, which can burst into flames easily in the brief presence of a source of inflammation and which will continue to burn after the removal of the source of inflammation or (iii) in gaseous phase, which are inflammable in air at normal pressure; or (iv) - which, when in contact with moist air or water, produce dangerous quantities of gases which areeasily inflammable.
4.	**Inflammable**	Liquid substances and preparations, with a flash point equal to or above 21°C and less than or equal to 55°C.
5.	**Irritant**	Non-corrosive substances and preparations which, when in immediate, extended or repeated contact with the skin and mucosa, can cause inflammation.
6.	**Harmful**	Substances and preparations which, in case of inhaling, swallowing or cutaneous penetration, can lead to risks of limited severity.
7.	**Toxic**	Substances and preparations (including highly toxic substances and preparations), which, in case of inhaling, swallowing or cutaneous penetration, can lead to serious, acute or chronic risks, and even death.
8.	**Carcinogenic**	Substances and preparations which, in case of inhaling, swallowing or cutaneous penetration, can lead to or increase the frequency of cancer.
9.	**Corrosive**	Substances and preparations which, in case of contact with living tissues, can destroy the latter.
10.	**Infectious**	Substances containing viable micro-organisms or their toxins, for which it is known or we have good reasons to believe that they cause disease in humans or other living organisms.
11.	**Harmful to reproductio n function**	substances and preparations which, in case of inhaling, swallowing or cutaneous penetration, can induce or increase the frequency of undesirable non-hereditary effects in offspring or have a negative effect on reproductive functions and abilities.
12.	**Mutagenic**	Substances and preparations which, in case of inhaling, swallowing or cutaneous penetration, can lead to hereditary genetic disorders or increase the frequency of these disorders.
13.	**React with water**	Substances and preparations which, in case of contact with water, air or an acid, release a toxic or highly toxic gas.
14.	**Sensitising**	Substances and preparations which, in case of inhaling or cutaneous penetration, can lead to a hypersensitization, so that renewed exposure to the substance or preparation will cause characteristic harmful effects. This property can only be considered if test methods are available.
15.	**Ecotoxic**	Substances and preparations with inherent or potential immediate or deferred risks for one orseveral environmental components.
16.	**Dangerous for the environment**	Substances and preparations which are likely, after elimination, to lead to another substance, by any means, e.g. a lixiviation product, with one of the above characteristics.

[1] Source : United Nations Environment Programme policy guidelines

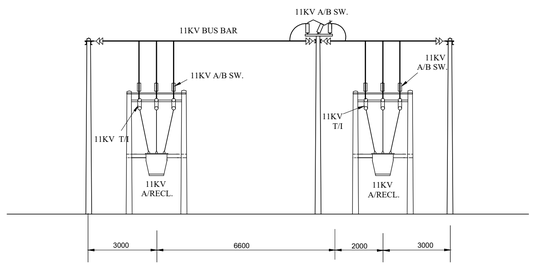


ELEVATION A-A

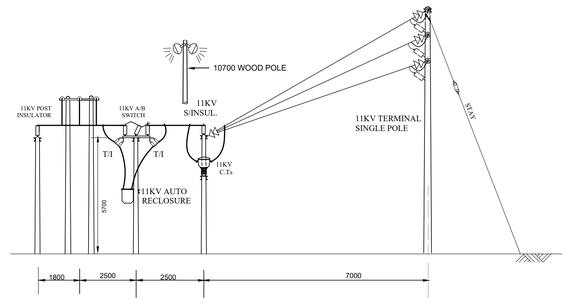




SCHEMATIC DIAGRAM



ELEVATION B - B



ELEVATION C-C

NOTE

ALL POLES ARE IN CONCRETE/ STEEL STRUCTURE AS PER ENGINEER'S APPROVALS

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL DMAN			
DRAWN	17-02-2025	D.O	
TRACED			

REF	DESCRIPTION	DATE	SIGN	CHECKED	SIGN
1					
2					
3					
4					
5					
6					
7					

PROPOSED GENERAL ARRANGEMENT OF MOI INTERNATIONAL AIRPORT(MIA) 2 x 2.5MVA 33/11KV S/STN.

SCALE 1:150

KAA

No.

EXISTING GSE YARD

12m

15m

26m

Substation KAA

TO CUSTOMER

KPLC BOUNDARY

GATE

20m

20m

20m

60m

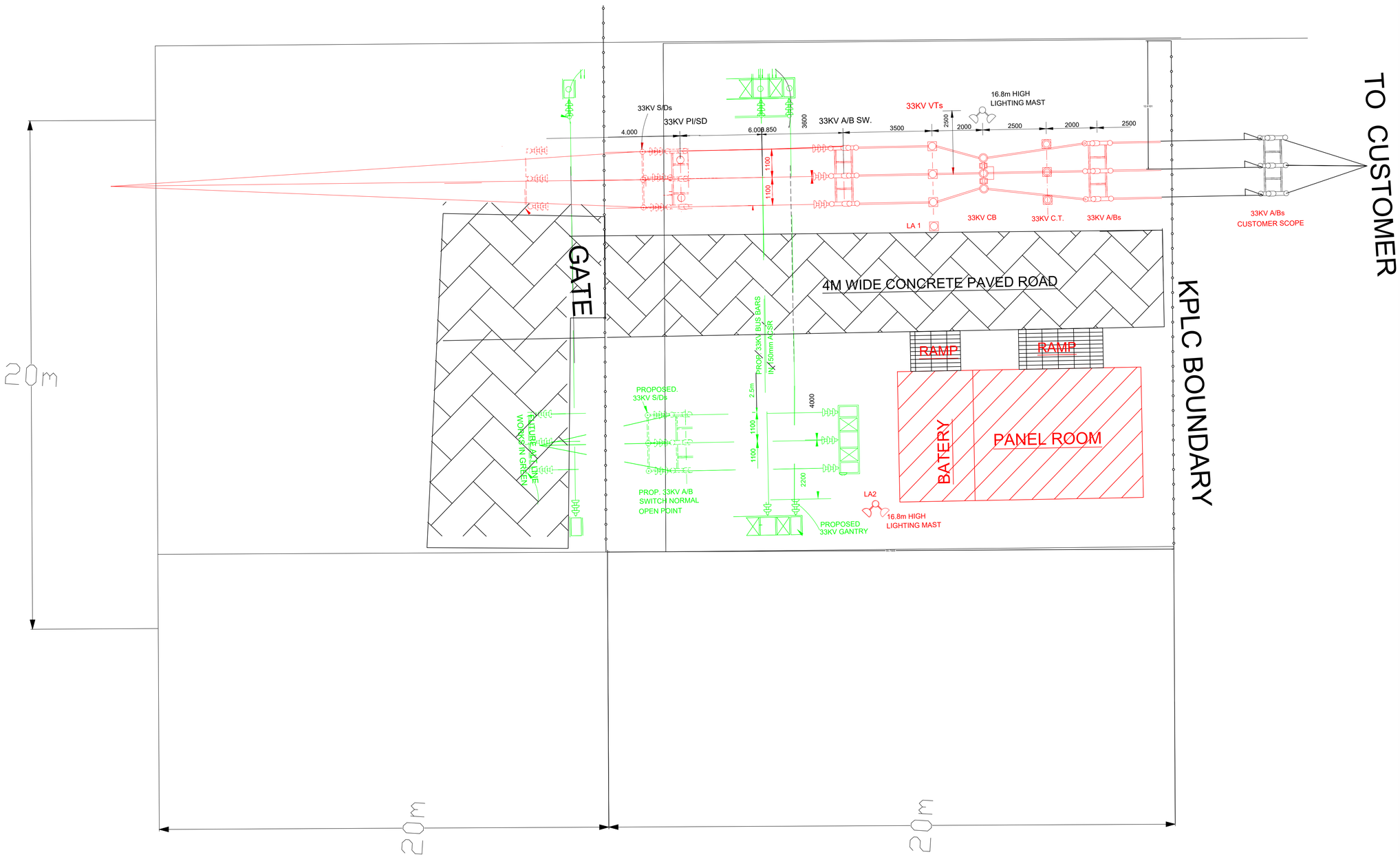
Existing Sewerline

ROAD

0+400

13.9m

66.66m



NOTE

ALL POLES ARE IN CONCRETE

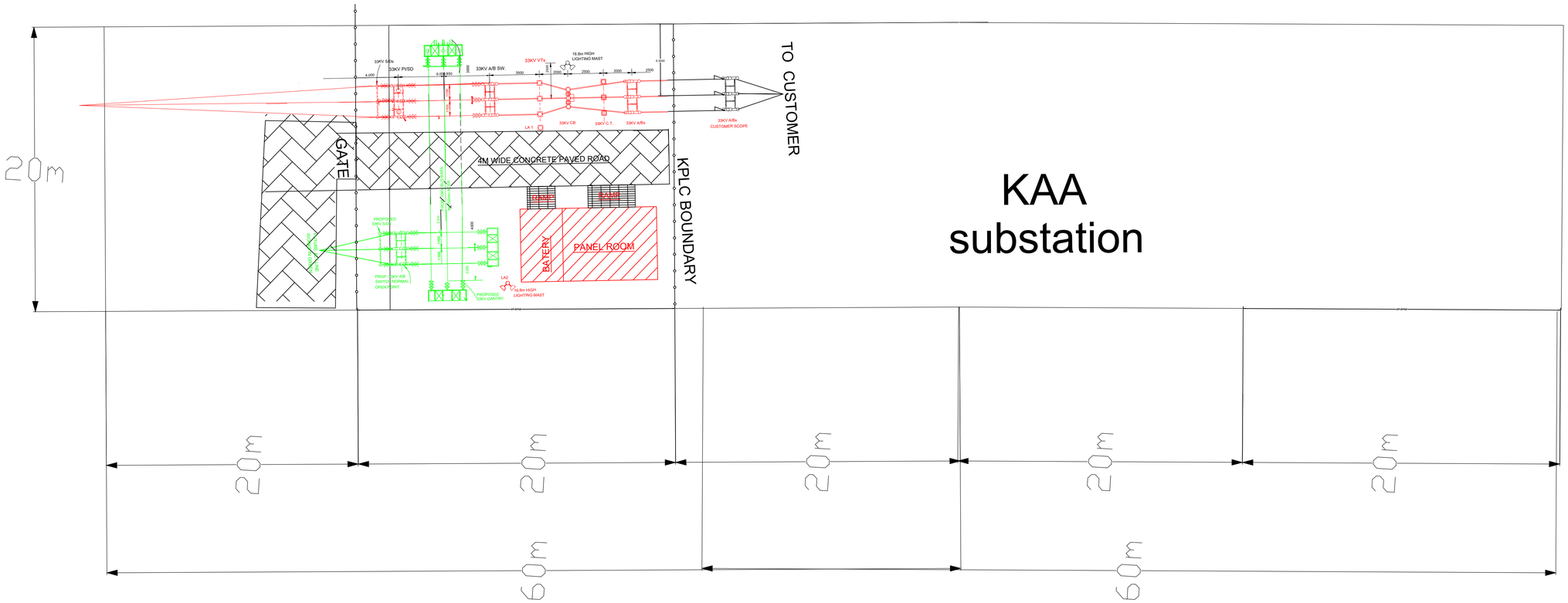
	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN	17-02-2025	D.O	
TRACED			

REF	DESCRIPTION	DATE	SIGN	CHECKED	SIGN
1					
2					
3					
4					
5					
6					
7					

PROPOSED GENERAL ARRANGEMENT OF MOI INTERNATIONAL AIRPORT(MIA) 33KV METERING STN- KPLC .

KAA

No.



KAA substation

NOTE

ALL POLES ARE IN CONCRETE

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN	17-02-2025	D.O	
TRACED			

REF	DESCRIPTION	DATE	SIGN	CHECKED	SIGN
1					
2					
3					
4					
5					
6					
7					

PROPOSED GENERAL ARRANGEMENT OF MOI INTERNATIONAL AIRPORT(MIA) KAA & KPLC S/STN .

NTS

KAA

No.