



Request for Bids

Plant

**Design, Supply, and Installation
(Two-Envelope with Rated Criteria)**

Procurement of Contractor for:

Zambia-Tanzania Interconnector Project – Package 3

June 2026

PART 1 – BIDDING PROCEDURES**Section I - Instructions to Bidders (ITB)**

This Section provides relevant information to help Bidders prepare their Bids. It is based on two-envelope bidding process with application of rated criteria. Information is also provided on the submission, opening, and evaluation of Bids and on the award of Contracts. **Section I contains provisions that are to be used without modification.**

Section II - Bid Data Sheet (BDS)

This Section consists of provisions that are specific to each procurement and that supplement the information or requirements included in Section I, Instructions to Bidders.

Section III- Evaluation and Qualification Criteria

This Section specifies the criteria to determine the Most Advantageous Bid, including the qualifications of the Bidder to execute the contract.

Section IV - Bidding Forms

This Section includes the forms to be completed and submitted by the Bidder as part of its Bid.

Section V - Eligible Countries

This Section contains information regarding eligible countries.

Section VI - Fraud and Corruption

the Fraud and Corruption provisions which apply to this Bidding process.

PART 2 – EMPLOYER’S REQUIREMENTS**Section VII - Employer’s Requirements**

This Section contains the Specification, the Drawings, and supplementary information that describe the Plant and Installation Services to be procured. The Employer’s Requirements also include the environmental and social (ES) requirements.

PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS**Section VIII - General Conditions of Contract (GCC)**

This Section contains the general clauses to be applied in all contracts. **The text of the clauses in this Section shall not be modified.**

Section IX - Particular Conditions of Contract (PCC)

This Section contains the Particular Conditions of Contract (PCC). The contents of this Section modify or supplement the General Conditions and shall be prepared by the Employer.

Section X - Contract Forms

This Section contains the Letter of Acceptance, Contract Agreement and other relevant forms.

Specific Procurement Notice

Request for Bids

Plant

Design, Supply and Installation

(Two-Envelope Bidding Process, Without Prequalification)

Employer: ZESCO Limited

Project: Zambia-Tanzania Interconnector Project

Contract title: Package -3- Design, Supply, and Installation for:

- (i) Double circuit 330 kV Kasama-Nakonde overhead transmission line, 212km length,
- (ii) Double circuit 400 kV overhead transmission line from Nakonde to the Tanzanian border, 15km length (charged at 330 kV), and
- (iii) Double circuit 132 kV Isoka-Nakonde (loop in and out of 66 kV Isoka - Nakonde line) overhead transmission line, 13km length.

Country: Zambia

Grant No.: IDA-E3960, TF-D0134 and TF-C8907

RFB No: ZM- ZM-ZESCO-495219-CW-RFB

Issued on: 1 June 2026

1. ZESCO Limited has applied for financing from the World Bank toward the cost of the **Zambia–Tanzania Interconnector Project**, and intends to apply part of the proceeds toward payments under the Contract for Package -3- Design, Supply, and Installation for:

- (i) Double circuit 330 kV Kasama-Nakonde overhead transmission line, 212km length,
- (ii) Double circuit 400 kV overhead transmission line from Nakonde to the Tanzanian border, 15km length (charged at 330 kV), and
- (iii) Double circuit 132 kV Isoka-Nakonde (loop in and out of 66 kV Isoka - Nakonde line) overhead transmission line, 13km length.

For this contract, the Borrower shall process the payments using the Direct Payment disbursement method, as defined in the World Bank's Disbursement Guidelines for Investment Project Financing, except for those payments, which the contract provides to be made through letter of credit.

2. ZESCO Limited now invites sealed Bids from eligible Bidders for Design, Supply, and Installation for:

- (i) Double circuit 330 kV Kasama-Nakonde overhead transmission line, 212km length,
- (ii) Double circuit 400 kV overhead transmission line from Nakonde to the Tanzanian border, 15km length (charged at 330 kV), and
- (iii) Double circuit 132 kV Isoka-Nakonde (loop in and out of 66 kV Isoka - Nakonde line) overhead transmission line, 13km length.

3. Bidding will be conducted through international competitive procurement using a Request for Bids (RFB) as specified in the “The World Bank Procurement Regulations for IPF Borrowers : Procurement in Investment Project Financing - Goods, Works, Non- Consulting and Consulting Services - Seventh Edition” (issued September 2025) (the “Procurement Regulations”) and is open to all eligible Bidders as defined in the Procurement Regulations.
4. Bids will be evaluated in accordance with the evaluation process set out in the bidding documents. The following weightings shall apply for Rated Criteria (including technical and non-price factors): 50% and for Bid cost: 50%.
5. Interested eligible Bidders may obtain further information from ZESCO Limited, Attention: Lemmy Nyirenda lnyirenda@zesco.co.zm and inspect the bidding document during office hours 07:30 AM to 5:00 PM, CAT at the address given below.
6. The bidding document in English may be purchased by interested eligible Bidders upon the submission of a written application to the address below and upon payment of a nonrefundable fee of **USD 300** to be deposited in the ZESCO Limited Bank Account provided below:

Bank Name: **ABSA BANK ZAMBIA PLC**

Account Name: **ZESCO LIMITED**

Branch Name: **CORPORATE**

Account Number: **01 - 1031102**

SWIFT Code: **BARCZMLXXXX**

Currency: **USD**

The document will be accessed by downloading from authorized ZESCO Limited website: <https://www.zesco.co.zm/tender.php> or sent by email on written request.

7. Bids must be delivered to the address below on or before **21 August 2026**. Electronic bidding will not be permitted. Late Bids will be rejected. The outer Bid envelopes marked “ORIGINAL BID”, and the inner envelopes marked “TECHNICAL PART” will be publicly opened in the presence of the Bidders’ designated representatives and anyone who chooses to attend, at the address below on **21 August 2026**, at 10:30 AM CAT. All envelopes marked “FINANCIAL PART” shall remain unopened and will be held in safe custody of the Employer until the second public Bid opening.
8. All Bids must be accompanied by a “*Bid Securing Declaration*” as per the details in the Request for Bids (RfB).
9. Attention is drawn to the Procurement Regulations requiring the Borrower to disclose information on the successful bidder’s beneficial ownership, as part of the Contract Award Notice, using the Beneficial Ownership Disclosure Form as included in the bidding document.
10. The address(es) referred to above is:

Attention: **Lemmy Nyirenda**

Address: **Stand No. 6949, Great East Road, P.O. Box 33304**

Procurement Offices, LDCC Building

City: **Lusaka**

ZIP Code: **10101**

Country: **Zambia**

Telephone: **+260 211 362 335**

Electronic mail address: lnyirenda@zesco.co.zm, copy matthew.ndhlovu@zesco.co.zm

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PART 1 – Bidding Procedures

Section I - Instructions to Bidders

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Section I - Instructions to Bidders

A. General

- 1. Scope of Bid**
- 1.1 In connection with the Specific Procurement Notice - Request for Bids (RFB), specified in the Bid Data Sheet (BDS), the Employer, as specified **in the BDS**, issues this bidding document for the Design, Supply and Installation of Plant as specified in Section VII, Employer's Requirements. The name, identification, and number of lots (contracts) of this RFB are specified **in the BDS**.
- 1.2 Throughout this bidding document:
- (a) the term **"in writing"** means communicated in written form (e.g., by mail, e-mail, fax, including if specified **in the BDS**, distributed or received through the electronic-procurement system used by the Employer) with proof of receipt;
 - (b) if the context so requires, "singular" means "plural" and vice versa;
 - (c) **"Day"** means calendar day, unless otherwise specified as **"Business Day."** A Business Day is any day that is an official working day of the Borrower. It excludes the Borrower's official public holidays;
 - (d) **"ES"** means environmental and social (including Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH));
 - (e) **"Sexual Exploitation and Abuse" "(SEA)"** means the following:

Sexual Exploitation is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another.

Sexual Abuse is defined as the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions.
 - (f) **"Sexual Harassment" "(SH)"** is defined as unwelcome sexual advances, requests for sexual favors, and other

verbal or physical conduct of a sexual nature by the Contractor's Personnel with other Contractor's or Employer's Personnel.

(g) **"Contractor's Personnel"** is as defined in GCC Sub-Clause 1; and

(h) **"Employer's Personnel"** is as defined in GCC Sub-Clause 1.

A non-exhaustive list of (i) behaviors which constitute SEA and (ii) behaviors which constitute SH is attached to the Code of Conduct form in Section IV.

2. Source of Funds	2.1 2.2	The Borrower or Recipient (hereinafter called "Borrower") indicated in the BDS has applied for or received financing (hereinafter called "funds") from the World Bank (hereinafter called "the Bank") in an amount specified in BDS, toward the project named in BDS. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this bidding document is issued. Payment by the Bank will be made only at the request of the Borrower and upon approval by the Bank in accordance with the terms and conditions of the Loan (or other financing) Agreement. The Loan (or other financing) Agreement prohibits a withdrawal from the loan account for the purpose of any payment to persons or entities, or for any import of goods, equipment, plant, or materials, if such payment or import is prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations. No party other than the Borrower shall derive any rights from the Loan (or other financing) Agreement or have any claim to the proceeds of the Loan (or other financing).
3. Fraud and Corruption	3.1 3.2	The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as set forth in Section VI. In further pursuance of this policy, bidders shall permit and shall cause their agents (where declared or not), subcontractors, subconsultants, service providers, suppliers, and personnel, to permit the Bank to inspect all accounts, records and other documents relating to any initial selection process, prequalification process, bid submission, proposal submission and contract performance (in the case of award), and to have them audited by auditors appointed by the Bank.
4. Eligible Bidders	4.1	A Bidder may be a firm that is a private entity, a state-owned enterprise or institution subject to ITB 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 letter 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 Bidding process and, in the event the JV is awarded the Contract, during contract execution. Unless specified **in the BDS**, there is no limit on the number of members in a JV.

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

- (a) directly or indirectly controls, is controlled by or is under common control with another Bidder; or
- (b) receives or has received any direct or indirect subsidy from another Bidder; or
- (c) has the same legal representative as another Bidder; or
- (d) has a relationship with another Bidder, directly or through common third parties, that puts it in a position to influence the Bid of another Bidder, or influence the decisions of the Employer regarding this Bidding 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 Bid; or
- (f) or any of its affiliates has been hired (or is proposed to be hired) by the Employer or Borrower 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 BDS ITB 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 Borrower (or of the project implementing agency, or of a recipient of a part of the loan) who: (i) are directly or indirectly involved in the preparation of the bidding document or specifications of the Contract,

and/or the Bid 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 Bank throughout the Bidding process and execution of the Contract.

- 4.3 A firm that is a Bidder (either individually or as a JV member) shall not participate as a Bidder or as JV member in more than one Bid except for permitted alternative Bids. Such participation shall result in the disqualification of all Bids in which the firm is involved. However, this does not limit the participation of a Bidder as subcontractor in another Bid or of a firm as a subcontractor in more than one Bid.
- 4.4 A Bidder may have the nationality of any country, subject to the restrictions pursuant to ITB 4.8. A Bidder shall be deemed to have the nationality of a country if the Bidder 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 subconsultants for any part of the Contract including related Services.
- 4.5 A Bidder that has been sanctioned by the Bank, pursuant to the Bank's Anti-Corruption Guidelines, in accordance with its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework as described in Section VI paragraph 2.2 d., shall be ineligible to be prequalified for, initially selected for, bid for, propose for, or be awarded a Bank-financed contract or benefit from a Bank-financed contract, financially or otherwise, during such period of time as the Bank shall have determined. The list of debarred firms and individuals is available at the electronic address specified in the BDS.
- 4.6 Bidders that are state-owned enterprises or institutions in the Employer's Country may be eligible to compete and be awarded a Contract(s) only if they can establish, in a manner acceptable to the Bank, that they (i) are legally and financially autonomous (ii) operate under commercial law, and (iii) are not under supervision of the Employer.
- 4.7 A Bidder shall not be under suspension from Bidding by the Employer as the result of the operation of a Bid-Securing Declaration or Proposal-Securing Declaration.
- 4.8 Firms and individuals may be ineligible if so indicated in Section V and (a) as a matter of law or official regulations, the Borrower's

country prohibits commercial relations with that country, provided that the Bank is satisfied that such exclusion does not preclude effective competition for the supply of goods or the contracting of works or services required; 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, the Borrower's country 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 (and more than one country is a Borrower, and is involved in the procurement), then exclusion of a firm or individual on the basis of ITB 4.8 (a) above by any country may be applied to that procurement across other countries involved, if the Bank and the Borrowers involved in the procurement agree.

- 4.9 A Bidder shall provide such documentary evidence of eligibility satisfactory to the Employer, as the Employer shall reasonably request.
- 4.10 A firm that is under a sanction of debarment by the Borrower from being awarded a contract is eligible to participate in this procurement, unless the Bank, at the Borrower's request, is satisfied that the debarment; (a) relates to fraud or corruption, and (b) followed a judicial or administrative proceeding that afforded the firm adequate due process.
- 4.11 This bidding is open only to prequalified Bidders unless specified **in the BDS.**

5. Eligible Plant and Installation Services

- 5.1 The Plant and Installation Services to be supplied under the Contract and financed by the Bank may have their origin in any country in accordance with Section V, Eligible Countries.
- 5.2 For purposes of ITB 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 different in its basic characteristics or in purpose or utility from its components.

B. Contents of Bidding Document

- 6. **Sections of Bidding Document**
 - 6.1 The bidding 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 ITB 8.
 - 6.2 The Specific Procurement Notice-Request for Bids (RFB) issued by the Employer, or the Notice of Request for Bids (RFB) issued by the

- Employer to the prequalified Bidders are not part of the bidding document.
- 6.3 Unless obtained directly from the Employer, the Employer is not responsible for the completeness of the document, responses to requests for clarification, the Minutes of the pre-Bid meeting (if any), or Addenda to the bidding document in accordance with ITB 8. In case of any contradiction, documents obtained directly from the Employer shall prevail.
- 6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the bidding document and to furnish with its Bid all information or documentation as is required by the bidding document.
- 7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting**
- 7.1 A Bidder requiring any clarification of the bidding document shall contact the Employer in writing at the Employer's address indicated **in the BDS** or raise his enquiries during the pre-Bid meeting if provided for in accordance with ITB 7.4. The Employer will respond in writing to any request for clarification, provided that such request is received prior to the deadline for submission of Bids within a period specified **in the BDS**. The Employer shall forward copies of its response to all Bidders who have acquired the bidding document in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. If so specified **in the BDS**, the Employer shall also promptly publish its response at the web page identified **in the BDS**. Should the clarification result in changes to the essential elements of the bidding document, the Employer shall amend the bidding document following the procedure under ITB 8 and ITB 23.2.
- 7.2 The Bidder is advised to visit and examine the site where the Plant is to be installed and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for the provision of Plant and Installation Services. The costs of visiting the site shall be at the Bidder's own expense.
- 7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.
- 7.4 If so specified **in the BDS**, the Bidder's designated representative is invited to attend a pre-Bid meeting and/or a site visit. The

purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

7.5 The Bidder is requested to submit any questions in writing, to reach the Employer not later than one week before the meeting.

7.6 Minutes of the pre-Bid meeting, including the text of the questions raised without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the bidding document in accordance with ITB 6.3. If so specified **in the BDS**, the Employer shall also promptly publish the Minutes of the pre-Bid meeting at the web page identified **in the BDS**. Any modification to the bidding document that may become necessary as a result of the pre-Bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to ITB 8 and not through the minutes of the pre-Bid meeting. Nonattendance at the pre-Bid meeting will not be a cause for disqualification of a Bidder.

8. Amendment of Bidding Document

8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the bidding document by issuing addenda.

8.2 Any addendum issued shall be part of the bidding document and shall be communicated in writing to all who have obtained the bidding document from the Employer in accordance with ITB 6.3. The Employer shall also promptly publish the addendum on the Employer's web page in accordance with ITB 7.1.

8.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may, at its discretion, extend the deadline for the submission of bids, pursuant to ITB 23.2.

C. Preparation of Bids

9. Cost of Bidding

9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall not be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process.

10. Language of Bid

10.1 The Bid, as well as all correspondence and documents relating to the Bid exchanged by the Bidder and the Employer, shall be written in the language specified **in the BDS**. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified **in the BDS**, in which case, for purposes of interpretation of the Bid, such translation shall govern.

**11. Documents
Comprising the
Bid**

- 11.1 The Bid shall comprise two Parts, namely the Technical Part and the Financial Part. These two Parts shall be submitted simultaneously in two separate sealed envelopes (two-envelope Bidding process). One envelope shall contain only information relating to the Technical Part and the other, only information relating to the Financial Part. These two envelopes shall be enclosed in a separate sealed outer envelope marked "ORIGINAL BID"
- 11.2 The Technical Part shall comprise the following:
- (a) **Letter of Bid** - Technical Part, prepared in accordance with ITB12;
 - (b) **Bid Security or Bid Securing Declaration**, in accordance with ITB 20;
 - (c) **Alternative Bid** - Technical Part: if permissible in accordance with ITB 13, the Technical Part of any Alternative Bid;
 - (d) **Authorization**: written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 21.3;
 - (e) **Eligibility of Plant and Installation Services**: documentary evidence established in accordance with ITB 14.1 that the Plant and Installation Services offered by the Bidder in its Bid or in any alternative Bid, if permitted, are eligible;
 - (f) **Bidder's Eligibility and Qualifications**: documentary evidence in accordance with ITB 15.1 establishing the Bidder's eligibility and qualifications ;
 - (g) **Conformity**: documentary evidence in accordance with ITB 16 that the Plant and Installation Services offered by the Bidder conform to the bidding document;
 - (h) **Subcontractors**: list of subcontractors in accordance with ITB 16.2; and
 - (i) any other document required **in the BDS**.
- 11.3 The Financial Part shall contain the following:
- (a) Letter of Bid – Financial Part: prepared in accordance with ITB 12 and ITB 14;
 - (b) **Price Schedules** completed in accordance with ITB 12 and ITB 17;
 - (c) Alternative Bid - Financial Part: if permissible in accordance with ITB 13, the Financial Part of any Alternative Bid; and
 - (d) any other document required in the BDS.
- 11.4 The Technical Part shall not include any information related to the Bid price. Where material financial information related to the Bid

price is contained in the Technical Part the Bid shall be declared non-responsive.

11.5 In addition to the requirements under ITB 11.2, Bids submitted by a JV shall include in the Technical Part a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all members and submitted with the Bid, together with a copy of the proposed Agreement.

11.6 The Bidder shall furnish in the Letter of Bid - Financial Part information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid

12. Letters of Bid and Price Schedules

12.1 The Letter of Bid - Technical Part and the Letter of Bid- Financial Part including the Price Schedules shall be prepared, using the relevant forms furnished in Section IV, Bidding 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 ITB 21.3. All blank spaces shall be filled in with the information requested.

13. Alternative Bids

13.1 Unless otherwise specified **in the BDS**, alternative Bids shall not be considered.

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

13.3 Except as provided under ITB 13.4 below, Bidders wishing to offer technical alternatives to the Employer's requirements as described in the bidding document must also provide: (i) a price at which they are prepared to offer a Plant meeting the Employer's requirements; and (ii) all information necessary for a complete evaluation of the alternatives by the Employer, 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 Bidder with the Most Advantageous Bid conforming to the basic technical requirements shall be considered by the Employer.

13.4 When Bidders are invited **in the BDS** to submit alternative technical solutions for specified parts of the facilities, such parts will be identified **in the BDS**, as will the method for their evaluation, and described in Section VII, Employer's Requirements.

14. Documents Establishing the Eligibility of the Plant and Installation Services	14.1	To establish the eligibility of the Plant and Installation Services in accordance with ITB 5, Bidders shall complete the country of origin declarations in the Price Schedule Forms, included in Section IV, Bidding Forms.
15. Documents Establishing the Eligibility and Qualifications of the Bidder	15.1	To establish Bidder's eligibility in accordance with ITB 4, Bidders shall complete the Letter of Bid- Technical Part, included in Section IV, Bidding Forms.
	15.2	To establish its qualifications to perform the Contract in accordance with Section III, Evaluation and Qualification Criteria, the Bidder shall provide the information requested in the corresponding information sheets included in Section IV, Bidding Forms.
	15.3	Any change in the structure or formation of a Bidder after being prequalified and invited to Bid, if applicable, (including, in the case of a JV, any change in the structure or formation of any member and also including any change in any specialized subcontractor whose qualifications were considered to prequalify the Applicant) shall be subject to the written approval of the Employer prior to the deadline for submission of Bids. Such approval shall be denied if (i) a Bidder proposes to associate with a disqualified Bidder or in case of a disqualified joint venture, any of its members; (ii) as a consequence of the change, the Bidder no longer substantially meets the qualification criteria; or (iii) in the opinion of the Employer, the change may result in a substantial reduction in competition. Any such change should be submitted to the Employer not later than fourteen (14) days after the date of the notice for RFB sent to the prequalified Bidders
16. Documents Establishing the Conformity of the Plant and Installation Services	16.1	The Bidder shall furnish the information stipulated in Section IV, Bidding Forms in sufficient detail to demonstrate substantial responsiveness of the Bidders' proposal to the work requirements and the completion time.
	16.2	For major items of Plant and Installation Services as listed by the Employer in Section III, Evaluation and Qualification Criteria, which the Bidder intends to purchase or subcontract, the Bidder shall give details of the name and nationality of the proposed Subcontractors, including manufacturers, for each of those items. In addition, the Bidder shall include in its Bid information establishing compliance with the requirements specified by the Employer 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.
	16.3	The Bidder shall be responsible for ensuring that any Subcontractor proposed complies with the requirements of ITB 4,

and that any Plant, or services to be provided by the Subcontractor comply with the requirements of ITB 5 and ITB 16.1.

17. Bid Prices and Discounts

- 17.1 Unless otherwise specified in the BDS, Bidders shall quote for the entire Plant and Installation Services on a “single responsibility” basis. The total Bid price shall include all the Contractor’s obligations mentioned in or to be reasonably inferred from the bidding 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 bidding 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 bidding document, all in accordance with the requirements of the General Conditions. Items against which no price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed to be covered by the prices for other items.
- 17.2 Bidders are required to quote the price for the commercial, contractual and technical obligations outlined in the bidding document.
- 17.3 Bidders shall give a breakdown of the prices in the manner and detail called for in the Price Schedules included in Section IV, Bidding Forms.
- 17.4 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, Bidding Forms, from those numbered 1 to 4 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 Bid price(s) to be entered in the Letter of Bid. Bidders 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 the Employer's Country
- Schedule No. 3:** Design Services
- Schedule No. 4:** Installation Services
- Schedule No. 5:** Grand Summary (Schedule Nos.1 to 4)
- Schedule No. 6:** Recommended Spare Parts
- Schedule No. 7:** Daywork Rates

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

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

The price of the Plant shall be quoted on CIP-named place of destination basis as specified **in the BDS**.

- (b) Plant manufactured within the Employer's Country (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), including all customs duties, sales and other taxes already paid or payable on the components and raw materials used in the manufacture or assembly of the Plant;

- (ii) Sales tax and all other taxes payable in the Employer's Country on the Plant if the contract is awarded to the Bidder;

- (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 BDS**, 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 bidding document, as necessary for the proper execution of the

installation and other services, including all taxes, duties, levies and charges payable in the Employer's Country as of twenty-eight (28) days prior to the deadline for submission of Bids;

- (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.

17.6 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 BDS.**

17.7 The prices shall be either fixed or adjustable as specified **in the BDS.**

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

17.9 In the case of **Adjustable Price**, prices quoted by the Bidder 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 Bid submitted with a fixed price quotation will not be rejected, but the price adjustment will be treated as zero. Bidders are required to indicate the source of labor and material indices in the corresponding Form in Section IV, Bidding Forms.

17.10 If so indicated in ITB 1.1, Bids are being invited for individual lots (contracts) or for any combination of lots (packages). Bidders wishing to offer any price reduction (discount) for the award of more than one Contract shall specify in their Letter of Bid 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. **However, discounts on condition of award of more than one contract will not be used for Bid evaluation purpose.**

17.11 Bidders wishing to offer any unconditional discount shall specify in their Letter of Bid the offered discounts and the manner in which price discounts will apply.

18. Currencies of Bid and Payment

18.1 The currency(ies) of the Bid and the currency(ies) of payments shall be the same. The Bidder shall quote in the currency of the Employer's country the portion of the Bid price that corresponds

- to expenditures incurred in the currency of the Employer's Country, unless otherwise specified **in the BDS**.
- 18.2 The Bidder may express the Bid price in any currency. If the Bidder 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 the Employer's Country.
- 19. Period of Validity of Bids**
- 19.1 Bids shall remain valid until the date specified **in the BDS** or any extended date if amended by the Employer in accordance with ITB 8. A Bid that is not valid until the date specified **in the BDS**, or any extended date if amended by the Employer in accordance with ITB 8, shall be rejected by the Employer as nonresponsive.
- 19.2 In exceptional circumstances, prior to the date of expiration of the Bid validity, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a Bid Security is requested in accordance with ITB 20, the Bidder granting the request shall also extend the Bid Security for twenty-eight (28) days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its Bid Security. A Bidder granting the request shall not be required or permitted to modify its Bid, except as provided in ITB 19.3.
- 19.3 If the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial Bid validity specified in accordance with ITB 19.1, the Contract price shall be determined as follows:
- (a) in the case of **fixed price** contracts, the Contract price shall be the Bid price adjusted by the factor or factors specified **in the BDS**;
 - (b) in the case of **adjustable price** contracts, no adjustment shall be made; or
 - (c) in any case, Bid evaluation shall be based on the Bid price without taking into consideration the applicable correction from those indicated above.
- 20. Bid Security**
- 20.1 The Bidder shall furnish as part of the Technical Part of its Bid, either a Bid-Securing Declaration or a Bid Security as specified **in the BDS**, in original form and, in the case of a Bid Security, in the amount and currency specified **in the BDS**.
- 20.2 A Bid-Securing Declaration shall use the form included in Section IV Bidding Forms.
- 20.3 If a Bid Security is specified pursuant to ITB 20.1, the Bid security shall be a demand guarantee in any of the following forms at the Bidder's option:

- (a) an unconditional guarantee issued by a bank or non-bank financial institution (such as an insurance, bonding or surety company);
- (b) an irrevocable letter of credit;
- (c) a cashier's or certified check; or
- (d) another security indicated **in the BDS**,

from a reputable source from an eligible country. If an unconditional guarantee is issued by a non-bank financial institution located outside the Employer's Country the issuing non-bank financial institution shall have a correspondent financial institution located in the Employer's Country to make it enforceable unless the Employer has agreed in writing, prior to Bid submission, that a correspondent financial institution is not required. In the case of a bank guarantee, the Bid Security shall be submitted either using the Bid Security Form included in Section IV, Bidding Forms, or in another substantially similar format approved by the Employer prior to Bid submission. The Bid Security shall be valid for twenty-eight (28) days beyond the original date of expiry of the Bid validity, or beyond any extended date if requested under ITB 19.2.

- 20.4 If a Bid Security or a Bid-Securing Declaration is specified pursuant to ITB 20.1, any Bid not accompanied by a substantially responsive Bid Security or Bid-Securing Declaration shall be rejected by the Employer as nonresponsive.
- 20.5 If a Bid Security is specified pursuant to ITB 20.1, the Bid Security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's furnishing of the Performance Security pursuant to ITB 47.
- 20.6 The Bid Security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required Performance Security.
- 20.7 The Bid Security may be forfeited:
 - (a) if a Bidder withdraws its Bid prior to the expiry date of the Bid validity specified by the Bidder on the Letter of Bid or any extended date provided by the Bidder; or
 - (b) if the successful Bidder fails to:
 - (i) sign the Contract in accordance with ITB 46; or
 - (ii) furnish a Performance Security in accordance with ITB 47.
- 20.8 The Bid Security or the Bid-Securing Declaration of a JV shall be in the name of the JV that submits the Bid. If the JV has not been legally constituted into a legally enforceable JV at the time of

bidding, the Bid Security or the Bid Securing Declaration shall be in the names of all future members as named in the letter of intent referred to in ITB 4.1 and ITB 11.5.

20.9 If a Bid Security is not required **in the BDS**: and

- (a) if a Bidder withdraws its Bid prior to the expiry date of the Bid validity specified by the Bidder on the Letter of Bid, or any extended date provided by the Bidder; or
- (b) if the successful Bidder fails to:
 - (i) sign the Contract in accordance with ITB 46; or
 - (ii) furnish a Performance Security in accordance with ITB 47;

the Borrower may, if provided for **in the BDS**, declare the Bidder disqualified to be awarded a contract by the Employer for a period of time as stated **in the BDS**.

21. Format and Signing of Bid

- 21.1 The Bidder shall prepare the Bid, in accordance with this Instruction, ITB 11 and ITB 22.
- 21.2 Bidders shall mark as “CONFIDENTIAL” information in their Bids which is confidential to their business. This may include proprietary information, trade secrets or commercial or financially sensitive information.
- 21.3 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified **in the BDS** and shall be attached to the Bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid where entries or amendments have been made shall be signed or initialed by the person signing the Bid.
- 21.4 In the case that the Bidder is a JV, the Bid 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.
- 21.5 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.

D. Submission of Bids

22. Submission, Sealing and Marking of Bids

- 22.1 The Bidder shall deliver the Bid in two separate, sealed envelopes (the Technical Part and the Financial Part.). These two envelopes shall be enclosed in a separate sealed outer envelope marked “Original Bid”. In addition, the Bidder shall submit copies of the Bid in the number specified **in the BDS**. Copies of the Technical Part shall be placed in a separate sealed envelope marked “COPIES: TECHNICAL PART”. Copies of the Financial Part shall be placed in a

separate sealed envelope marked “COPIES: FINANCIAL PART”. The Bidder shall place both of these envelopes in a separate, sealed outer envelope marked “BID COPIES”. In the event of any discrepancy between the original and the copies, the original shall prevail.

22.2 If alternative Bids are permitted in accordance with ITB 13, the alternative Bids shall be submitted as follows: the original of the alternative Bid Technical Part shall be placed in a sealed envelope marked “ALTERNATIVE BID – TECHNICAL PART” and the Financial Part shall be placed in a sealed envelope marked “ALTERNATIVE BID – FINANCIAL PART” and these two separate sealed envelopes then enclosed within a sealed outer envelope marked “ALTERNATIVE BID – ORIGINAL”, the copies of the alternative Bid will be placed in separate sealed envelopes marked “ALTERNATIVE BID – COPIES OF TECHNICAL PART”, and “ALTERNATIVE BID – COPIES OF FINANCIAL PART” and enclosed in a separate sealed outer envelope marked “ALTERNATIVE BID - COPIES”.

22.3 The envelopes marked “ORIGINAL BID” and “BID COPIES” (and, if appropriate, a third envelope marked “ALTERNATIVE BID”) shall be enclosed in a separate sealed outer envelope for submission to the Employer.

22.4 The inner and outer envelopes shall:

- (a) bear the name and address of the Bidder;
- (b) be addressed to the Employer in accordance with ITB 23.1;
- (c) bear the specific identification of this Bidding process indicated in accordance with ITB 1.1; and
- (d) bear a warning not to open before the time and date for Bid opening.

22.5 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

23. Deadline for Submission of Bids

23.1 Bids must be received by the Employer at the address and no later than the date and time indicated **in the BDS**. When so specified **in the BDS**, Bidders shall have the option of submitting their Bids electronically. Bidders submitting Bids electronically shall follow the electronic Bid submission procedures specified **in the BDS**.

23.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the bidding document in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

24. Late Bids

24.1 The Employer shall not consider any Bid that arrives after the deadline for submission of Bids, in accordance with ITB 23. Any

Bid received by the Employer after the deadline for submission of Bids shall be declared late, rejected, and returned unopened to the Bidder.

- 25. Withdrawal, Substitution, and Modification of Bids**
- 25.1 A Bidder may withdraw, substitute, or modify its bid 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 ITB 21.3, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be:
- (a) prepared and submitted in accordance with ITB 21 and ITB 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 Employer prior to the deadline prescribed for submission of Bids, in accordance with ITB 23.
- 25.2 Bids requested to be withdrawn in accordance with ITB 25.1 shall be returned unopened to the Bidders.
- 25.3 No Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the date of expiry of the Bid validity specified by the Bidder on the Letter of Bid or any extended date thereof.

E. Public Opening of Technical Parts of Bids

- 26. Public Opening of Technical Parts of Bids**
- 26.1 Except as in the cases specified in ITB 24 and ITB 25.2, the Employer shall publicly open and read out all Bids received by the deadline at the date, time and place specified **in the BDS** in the presence of Bidders’ designated representatives and anyone who choose to attend. Any specific electronic Bid opening procedures required if electronic Bidding is permitted in accordance with ITB 23.1, shall be as specified **in the BDS**.
- 26.2 First, the written notice of withdrawal in the envelopes marked “Withdrawal” shall be opened and read out and the envelope with the corresponding Bid shall not be opened but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at Bid opening.
- 26.3 Next, envelopes marked “Substitution” shall be opened and read out and exchanged with the corresponding Bid being substituted, and the substituted Bid shall not be opened, but returned to the Bidder. No Bid substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at Bid opening.

- 26.4 Next, envelopes marked “Modification” shall be opened and read out with the corresponding Bid. No Bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at Bid opening.
- 26.5 Next, all other envelopes marked “TECHNICAL PART” shall be opened one at a time. All envelopes marked “SECOND ENVELOPE: Financial PART” shall remain sealed and kept by the Employer in safe custody until they are opened at a later public opening, following the evaluation of the Technical Part parts of the Bids. On opening the envelopes marked “TECHNICAL PART” the Employer shall read out: the name of the Bidder, the presence or the absence of a Bid Security, or Bid-Securing Declaration, if required, and whether there is a modification; and Alternative Bid - Technical Part; and any other details as the Employer may consider appropriate.
- 26.6 Only Technical Parts of Bids and Alternative Bid - Technical Parts that are read out at Bid opening shall be considered further for evaluation. The Letter of Bid- Technical Part and the separate sealed envelope marked “SECOND ENVELOPE: FINANCIAL PART” are to be initialled by representatives of the Employer attending Bid opening in the manner specified **in the BDS**.
- 26.7 The Employer shall neither discuss the merits of any Bid nor reject any Bid (except for late Bids, in accordance with ITB 24.1).
- 26.8 The Employer shall prepare a record of the Bid opening that shall include, as a minimum:
- (a) the name of the Bidder and whether there is a withdrawal, substitution, or modification;
 - (b) the receipt of envelopes marked “SECOND ENVELOPE: FINANCIAL PART”;
 - (c) if applicable, any alternative Bid-Technical Part; and
 - (d) the presence or absence of a Bid Security or a Bid-Securing Declaration.
- 26.9 The Bidders’ representatives who are present shall be requested to sign the record. The omission of a Bidder’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 Bidders.

F. Evaluation of Bids – General Provisions

- 27. Confidentiality** 27.1 Information relating to the evaluation of the Technical Part shall not be disclosed to Bidders or any other persons not officially concerned with the Bidding process until the notification of evaluation of the Technical Part in accordance with ITB 33. Information relating to the evaluation of Financial Part, the evaluation of combined Technical Part and Financial Part, and

recommendation of contract award shall not be disclosed to Bidders or any other persons not officially concerned with the RFB process until the Notification of Intention to Award the Contract is transmitted to Bidders in accordance with ITB 42..

- 27.2 Any effort by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its Bid.
- 27.3 Notwithstanding ITB 27.2, from the time of Bid opening to the time of Contract Award, if any Bidder wishes to contact the Employer on any matter related to the Bidding process, it should do so in writing.

28. Clarification of Bids

- 28.1 To assist in the examination, evaluation, and comparison of the Bids, and qualification of the Bidders, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall be in writing. No change in the prices or substance of the Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids, in accordance with ITB 35.
- 28.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.

29. Deviations, Reservations, and Omissions

- 29.1 During the evaluation of Bids, the following definitions apply:
- (a) "Deviation" is a departure from the requirements specified in the bidding document;
 - (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the bidding document; and
 - (c) "Omission" is the failure to submit part or all of the information or documentation required in the bidding document.
- 29.2 Provided that a Bid is substantially responsive, the Employer may waive any nonmaterial nonconformities in the Bid.
- 29.3 Provided that a Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

G. Evaluation of Technical Part of Bids

30. Determination of Responsiveness of Technical Part	30.1	The Employer's determination of the Technical Part's responsiveness shall be based on the contents of the Bid, as specified in ITB 11.
	30.2	Preliminary examination of the Technical Part shall be carried out to identify proposals that are incomplete, invalid or substantially nonresponsive to the requirements of the Bidding documents. A substantially responsive Bid is one that materially confirms to the requirements of the Bidding 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 Works specified in the Contract; or (ii) limit in any substantial way, inconsistent with the Bidding document, the Employer's rights or the Bidder's obligations under the proposed Contract; or (b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.
	30.3	If the Technical Part is not substantially responsive to the requirements of the Bidding document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.
31. Eligibility and Qualifications of the Bidder	31.1	The Employer shall determine to its satisfaction whether the Bidders that have been assessed to have submitted substantially responsive Bids are eligible, and either continue to meet (if prequalification applies) or meet (if prequalification has not been carried out), the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.
	31.2	The determination shall be based upon an examination of the documentary evidence of the Bidder's eligibility and qualifications submitted by the Bidder, pursuant to ITB 15. The determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialized Subcontractors if permitted in the bidding document), or any other firm.
	31.3	Prior to Contract award, the Employer will verify that the successful Bidder (including each member of a JV) is not disqualified by the Bank due to noncompliance with contractual SEA/SH prevention and response obligations. The Employer will conduct the same verification for each subcontractor proposed by the successful Bidder. If any proposed subcontractor does not

meet the requirement, the Employer will require the Bidder to propose a replacement subcontractor.

- 31.4 Only substantially responsive bids submitted by eligible and qualified bidders shall proceed to the detailed technical evaluation specified in ITB 32.
- 32. Detailed Evaluation of Technical Part**
- 32.1 The Employer's evaluation of Technical Part will be carried out as specified in Section III, Evaluation and Qualification Criteria.
- 32.2 The scores and weightings to be given to Rated Criteria (including technical and non-price factors and sub factors) are specified **in the BDS**.

H. Notification of Evaluation of Technical Parts and Public Opening of Financial Parts

- 33. Notification of Evaluation of Technical Parts and Public Opening of Financial Parts**
- 33.1 Following the completion of the evaluation of the Technical Parts of the Bids, the Employer shall notify in writing those Bidders whose Bids were considered substantially non-responsive to the bidding document or failed to meet the eligibility and qualification requirements, advising them of the following information:
- (a) the grounds on which their Technical Part of Bid failed to meet the requirements of the bidding document;
 - (b) their envelopes marked "SECOND ENVELOPE: FINANCIAL PART" will be returned to them unopened after the completion of the selection process and the signing of the Contract; and
 - (c) notify them of the date, time and location of the public opening of the envelopes marked "SECOND ENVELOPE: FINANCIAL PART".
- 33.2 The Employer shall, simultaneously, notify in writing those Bidders whose Technical Part have been evaluated as substantially responsive to the bidding document and met the eligibility and qualification requirements, advising them of the following information:
- (a) their Bid has been evaluated as substantially responsive to the bidding document and met the eligibility and qualification requirements;
 - (b) their envelope marked "SECOND ENVELOPE: FINANCIAL PART" will be opened at the public opening of the Financial Parts; and
 - (c) notify them of the date, time and location of the second public opening of the envelopes marked "SECOND ENVELOPE: FINANCIAL PART" as specified **in the BDS**.
- 33.3 The opening date shall be not less than ten (10) Business Days from the date of notification of the results of the technical

evaluation, specified in ITB 33.1 and 33.2. However, if the Employer receives a complaint on the results of the technical evaluation within the ten (10) Business Days, the opening date shall be subject to ITB 48.1. The Financial Part of the Bid shall be opened publicly in the presence of Bidders' designated representatives and anyone who chooses to attend.

- 33.4 At this public opening, the Financial Parts will be opened by the Employer in the presence of Bidders, or their designated representatives and anyone else who chooses to attend. Bidders who met the eligibility and qualification requirements and whose bids were evaluated as substantially responsive will have their envelopes marked "SECOND ENVELOPE: FINANCIAL PART" opened at the second public opening. Each of these envelopes marked "SECOND ENVELOPE: FINANCIAL PART" shall be inspected to confirm that they have remained sealed and unopened. These envelopes shall then be opened by the Employer. The Employer shall read out the names of each Bidder, the technical score and the total Bid prices, per lot (contract) if applicable, including any discounts and Alternative Bid - Financial Part, and any other details as the Employer may consider appropriate.
- 33.5 Only envelopes of Financial Part of Bids, Financial Parts of Alternative Bids and discounts that are opened and read out at Bid opening shall be considered further for evaluation. The Letter of Bid – Financial Part and the Priced Activity Schedules are to be initialed by a representative of the Employer attending the Bid opening in the manner specified **in the BDS**.
- 33.6 The Employer shall neither discuss the merits of any Bid nor reject any envelopes marked "SECOND ENVELOPE: FINANCIAL PART" at this public opening.
- 33.7 The Employer shall prepare a record of the Financial Part of the Bid opening that shall include, as a minimum: (a) the name of the Bidder whose Financial Part was opened; (b) the Bid price, per lot (contract) if applicable, including any discounts; and (c) if applicable, any Alternative Bid – Financial Part.
- 33.8 The Bidders whose envelopes marked "SECOND ENVELOPE: FINANCIAL PART" have been opened or their representatives who are present shall be requested to sign the record. The omission of a Bidder'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 Bidders.

I. Evaluation of Financial Part of Bids

- 34. Adjustments for Non-material Noconformities** 34.1 Provided that a Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for

comparison purposes only, to reflect the price of a missing or non-conforming item or component by adding the average price of the item or component quoted by substantially responsive Bidders. If the price of the item or component cannot be derived from the price of other substantially responsive Bidders, the Employer shall use its best estimate.

35. Correction of Arithmetic Errors	35.1 In evaluating the Financial Part of each Bid, the Employer shall correct arithmetical errors on the following basis: (a) where there are errors between the total of the amounts given under the column for the price breakdown and the amount given under the Total Price, the former shall prevail and the latter will be corrected accordingly; (b) where there are errors between the total of the amounts of Schedule Nos. 1 to 4 and the amount given in Schedule No. 5 (Grand Summary) the former shall prevail and the latter will be corrected accordingly; (c) 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. 35.2 Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with ITB 35.1, shall result in the rejection of the Bid.
36. Evaluation Process, Financial Part	36.1 To evaluate the Financial Part, the Employer shall consider the following: (a) the Bid price, excluding provisional sums and the provision, if any, for contingencies in the Price Schedules; (b) price adjustment for correction of arithmetic errors in accordance with ITB 35.1; (c) price adjustment due to discounts offered in accordance with ITB 17.11; (d) price adjustment due to quantifiable nonmaterial nonconformities in accordance with ITB 34.1; (e) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 36.2; and (f) the evaluation factors indicated in the BDS and detailed in Section III, Evaluation and Qualification Criteria. 36.2 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.

- 36.3 No margin of domestic preference shall apply.
- 36.4 If price adjustment is allowed in accordance with ITB 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 Bid evaluation.
- 36.5 If this bidding document allows Bidders to quote separate prices for different lots (contracts), each lot will be evaluated separately to determine the Most Advantageous Bid using the methodology specified in Section III, Evaluation and Qualification Criteria. **Discounts that are conditional on the award of more than one lot or slice shall not be considered for Bid evaluation.**
- 37. Abnormally Low Bids**
- 37.1 An Abnormally Low Bid is one where the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder to perform the Contract for the offered Bid Price.
- 37.2 In the event of identification of a potentially Abnormally Low Bid, the Employer shall seek written clarifications from the Bidder, including detailed price analyses of its Bid 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 bidding document.
- 37.3 After evaluation of the price analyses, in the event that the Employer determines that the Bidder has failed to demonstrate its capability to deliver the contract for the offered tender price, the Employer shall reject the Bid.
- 38. Unbalanced or Front Loaded Bids**
- 38.1 If the Bid that is evaluated as the lowest evaluated cost is, in the Employer's opinion, seriously unbalanced or front loaded the Employer may require the Bidder to provide written clarifications. Clarifications may include detailed price analyses to demonstrate the consistency of the Bid prices with the scope of works, proposed methodology, schedule and any other requirements of the bidding document.
- 38.2 After the evaluation of the information and detailed price analyses presented by the Bidder, the Employer may:
- (a) accept the Bid; or
 - (b) if appropriate, require that the total amount of the Performance Security be increased, at the expense of the Bidder, to a level not exceeding twenty percent (20%) of the Contract Price; or
 - (c) reject the Bid.

J. Evaluation of Combined Technical and Financial Parts, Most Advantageous Bid and Notification of Intention to Award

39. Evaluation of combined Technical and Financial Parts, Most Advantageous Bid	39.1 39.2 39.3	The Employer's evaluation of responsive Bids will take into account technical factors, in addition to cost factors in accordance with Section III Evaluation and Qualification Criteria. The weight to be assigned for the Technical factors and cost is specified in the BDS. The Employer will rank the Bids based on the evaluated Bid score (B). The Employer shall determine the Most Advantageous Bid. The Most Advantageous Bid is the Bid of the Bidder that meets the Qualification Criteria and whose Bid has been determined to be substantially responsive to the Bidding document and is the Bid with the highest combined technical and financial score The capabilities of the manufacturers and subcontractors proposed in its Bid to be used by the Bidder with the Most Advantageous Bid 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 letter of intent between the parties, as needed. Should a manufacturer or subcontractor be determined to be unacceptable, the Bid will not be rejected, but the Bidder will be required to substitute an acceptable manufacturer or subcontractor without any change to the Bid 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.
40. Employer's right to Accept Any Bid and to Reject Any or All Bids	40.1	The Employer reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids at any time prior to Contract Award, without thereby incurring any liability to Bidders. In case of annulment, all Bids submitted and specifically, Bid securities shall be promptly returned to the Bidders.
41. Standstill Period	41.1	The Contract shall not be awarded earlier than the expiry of the Standstill Period. The Standstill Period shall be ten (10) Business Days unless extended in accordance with ITB 45. The Standstill Period commences the day after the date the Employer has transmitted to each Bidder the Notification of Intention to Award the Contract. Where only one Bid is submitted, or if this contract is in response to an emergency situation recognized by the Bank, the Standstill Period shall not apply.

- 42. Notification of Intention to Award**
- 42.1 The Employer shall send to each Bidder the Notification of Intention to Award the Contract to the successful Bidder. The Notification of Intention to Award shall contain, at a minimum, the following information:
- (a) the name and address of the Bidder submitting the successful Bid;
 - (b) the Contract price of the successful Bid;
 - (c) the total combined score of the successful Bid;
 - (d) the names of all Bidders who submitted Bids, and their Bid prices as readout, and as evaluated and technical score;
 - (e) a statement of the reason(s) the Bid (of the unsuccessful Bidder to whom the notification is addressed) was unsuccessful;
 - (f) the expiry date of the Standstill Period; and
 - (g) instructions on how to request a debriefing and/or submit a complaint during the standstill period.

K. Award of Contract

- 43. Award Criteria**
- 43.1 Subject to ITB 40, the Employer shall award the Contract to the successful Bidder. This is the Bidder whose Bid has been determined to be the Most Advantageous Bid.
- 44. Notification of Award**
- 44.1 Prior to the date of expiry of the bid validity, and upon expiry of the Standstill Period, specified in ITB 41.1 or any extension thereof, and upon satisfactorily addressing any complaint that has been filed within the Standstill Period, the Employer shall notify the successful Bidder, in writing, that its Bid has been accepted. The notification of award (hereinafter and in the Contract Forms called the "Letter of Acceptance") shall specify the sum that the Employer will pay the Contractor in consideration of the execution of the contract (hereinafter and in the Conditions of Contract and Contract Forms called "the Contract Price").
- 44.2 Within ten (10) Business Days after the date of transmission of the Letter of Acceptance, the Employer shall publish the Contract Award Notice which shall contain, at a minimum, the following information:
- (a) name and address of the Employer;
 - (b) name and reference number of the contract being awarded, and the selection method used;
 - (c) names of all Bidders that submitted Bids, and their Bid prices as read out at Bid opening, and as evaluated;

- (d) names of all Bidders whose Bids were rejected either as nonresponsive or as not meeting qualification criteria, or were not evaluated, with the reasons therefor;
 - (e) the name of the successful Bidder, the final total contract price, the contract duration and a summary of its scope; and
 - (f) successful Bidder's Beneficial Ownership Disclosure Form.
- 44.3 The Contract Award Notice shall be published on the Employer's website with free access if available, or in at least one newspaper of national circulation in the Employer's Country, or in the official gazette. The Employer shall also publish the contract award notice in UNDB online.
- 44.4 Until a formal contract is prepared and executed, the Letter of Acceptance shall constitute a binding Contract
- 45. Debriefing by the Employer**
 - 45.1 On receipt of the Employer's Notification of Intention to Award referred to in ITB 42, an unsuccessful Bidder has three (3) Business Days to make a written request to the Employer for a debriefing. The Employer shall provide a debriefing to all unsuccessful Bidders whose request is received within this deadline.
 - 45.2 Where a request for debriefing is received within the deadline, the Employer shall provide a debriefing within five (5) Business Days, unless the Employer decides, for justifiable reasons, to provide the debriefing outside this timeframe. In that case, the standstill period shall automatically be extended until five (5) Business Days after such debriefing is provided. If more than one debriefing is so delayed, the standstill period shall not end earlier than five (5) Business Days after the last debriefing takes place. The Employer shall promptly inform, by the quickest means available, all Bidders of the extended standstill period.
 - 45.3 Where a request for debriefing is received by the Employer later than the three (3)-Business Day deadline, the Employer should provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of Public Notice of Award of contract. Requests for debriefing received outside the three (3)-day deadline shall not lead to extension of the standstill period.
 - 45.4 Debriefings of unsuccessful Bidders may be done in writing or verbally. The Bidder shall bear their own costs of attending such a debriefing meeting.
- 46. Signing of Contract**
 - 46.1 The Employer shall send to the successful Bidder the Letter of Acceptance including the Contract Agreement, and a request to submit the Beneficial Ownership Disclosure Form providing additional information on its beneficial ownership. The Beneficial Ownership Disclosure Form shall be submitted within eight (8) Business Days of receiving this request.

- 46.2 The successful Bidder shall sign, date and return to the Employer, the Contract Agreement within twenty-eight (28) days of its receipt.
- 46.3 Notwithstanding ITB 46.2 above, in case signing of the Contract Agreement is prevented by any export restrictions attributable to the Employer, to the country of the Employer, 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 Bidder shall not be bound by its Bid, always provided, however, that the Bidder can demonstrate to the satisfaction of the Employer and of the Bank that signing of the Contract Agreement has not been prevented by any lack of diligence on the part of the Bidder 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.
- 47. Performance Security**
- 47.1 Within twenty-eight (28) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish the Performance Security in accordance with the General Conditions GCC 13.3, subject to ITB 38, using for that purpose the Performance Security Form included in Section X, Contract Forms, or another form acceptable to the Employer. If the Performance Security furnished by the successful Bidder is in the form of a bond, it shall be issued by a bonding or insurance company that has been determined by the successful Bidder to be acceptable to the Employer. A foreign institution providing a bond shall have a correspondent financial institution located in the Employer's Country, unless the Employer has agreed in writing that a correspondent financial institution is not required.
- 47.2 Failure of the successful Bidder 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 Bid Security. In that event the Employer may award the Contract to the Bidder offering the next Most Advantageous Bid.
- 48. Procurement Related Complaint**
- 48.1 The procedures for making a Procurement-related Complaint are as specified in the BDS.

Section II – Bid Data Sheet

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

A. General	
ITB 1.1	The reference number of the Request for Bids (RFB) is: ZM-ZESCO-495219-CW-RFB The Employer is: ZESCO Limited The name of the RFB is: Design, Supply, and Installation of: i. Double circuit 330 kV Kasama-Nakonde overhead transmission line, 212km length, ii. Double circuit 400 kV overhead transmission line from Nakonde to the Tanzanian border, 15km length (charged at 330 kV), and iii. Double circuit 132 kV Isoka-Nakonde (loop in and out of 66 kV Isoka - Nakonde line) overhead transmission line, 13km length. The number and identification of lots (contracts) comprising this RFB is: None
ITB 1.2 (	N/A
ITB 2.1	The Borrower is: Government of the Republic of Zambia <i>The Project Implementation Entity is: ZESCO Limited</i> The amount of the financing is: USD 292 Million The name of the Project is: Zambia-Tanzania Interconnector Project (ZTIP) - P507033
ITB 4.1	Maximum number of members in the Joint Venture (JV) shall be: Three (03)
ITB 4.5	A list of debarred firms and individuals is available on the Bank's external website https://www.worldbank.org/en/projects-operations/procurement/debarred-firms
ITB 4.11	This Bidding Process <i>is not</i> subject to prequalification.
B. Bidding Document	
ITB 7.1	For <u>Clarification of Bid purposes</u> only, the Employer's address is: Attention: <i>Lemmy Nyirenda</i> Address: <i>Stand No. 6949, Great East Road, P.O. Box 33304</i> Procurement Offices, LDCC Building _____ City: <i>Lusaka</i> ZIP Code: <i>10101</i> Country: <i>Zambia</i>

	Telephone: +260 211 362 330 Electronic mail address: Inyirenda@zesco.co.zm Requests for clarification shall be received by the Employer no later than: 14 days before the bid deadline as per ITB 7.3.1. Web page: www.zesco.co.zm In case a Bidder requests clarification of the Request for Bid Documents, a copy of the request sent to the Employer shall be sent to the Employer's Consultant Sweco, to the following e-mail addresses: - Maria Vabulis – maria.vabulis@sweco.se - Lars Wennmark – lars.wennmark@sweco.se
ITB 7.4	A Pre-Bid meeting and Site visit shall take place at the following date, time and place: Date: 15 to 16 June 2026 Time: 9:00 AM, CAT Place: 330kV Kasama Substation, Kasama Town, Zambia Alternatively, interested bidders may participate in the pre-bid meeting virtually through a link that will be shared prior to the meeting. If for any reason the virtual meeting has any problem the project will not be responsible. A site visit shall be organized by the Employer, immediately thereafter. <u>The costs of visiting the site shall be at the Bidder's own expense.</u> Bidders are requested to submit (if any) questions in writing at least one week before the Pre-Bid meeting to above address.
ITB 7.6	Web page https://www.zesco.co.zm/tender.php
C. Preparation of Bids	
ITB 10.1	The language of the Bid is: <i>English</i> All correspondence exchange shall be in English language. Language for translation of supporting documents and printed literature is English.
ITB 11 (i)	The Bidder shall submit the following additional documents in the Technical Part of its Bid: a) Manufacturer's authorization in case the bidder is not a manufacturer b) Technical Particulars/characteristics duly completed and signed by the manufacturer as per Guaranteed Technical Characteristics of the Technical Specifications. c) Manufacturers shall have ISO 9001:2015 or equivalent quality assurance certificate. A copy of such certificate shall be submitted with the bid in addition to the requirements of Section III Evaluation and Qualification Criteria. d) Bidder shall have ISO 9001:2015 (or equivalent quality assurance certificate) and ISO 14001:2015 or ISO 45001:2018 certifications (or equivalent). A copy of such certificates shall be submitted with the bid. e) Valid type Tests certificates from accredited Laboratories as required in the Technical Specifications and Performance Qualifications f) The accreditation certificate for the testing lab to ISO/IEC 17025

	g) Additional information such as brochures/catalogues/drawings and any other describing in detail the proposed items. h) The Manufacturer's Declaration of Conformity to reference standards. i) Statement of compliance to Employer's Requirements (indicate deviations if any and supporting documents in the bid) j) Documentary Evidence indicating the Bidder's Supplies record (or of Manufacturer if bidder is not manufacturer) stipulated in Section III of the Evaluation criteria, Post Qualification Requirements k) _____ Code of Conduct for Contractor's Personnel (ES) The Bidder shall submit its Code of Conduct that will apply to the Contractor's Personnel (as defined in GCC Sub- Clause 1) employed for the execution of Installation Services (defined in GCC Sub- Clause 1) at the Site (or other places in the country where the Site is located), to ensure compliance with the Contractor's Environmental and Social (ES) obligations under the Contract. The Bidder shall use for this purpose the Code of Conduct form provided in Section IV. No substantial modifications shall be made to this form, except that the Bidder may introduce additional requirements, including those necessary to take into account specific Contract issues/risks. l) _____ Management Strategies and Implementation Plans (MSIP) to manage the (ES) risks The Bidder shall submit Management Strategies and Implementation Plans (MSIPs) to manage key Environmental and Social (ES) risks.: _____ The _____ following documents will be prepared by the bidders to address the above listed risks • Contractor Environmental and Social Management Plan (CESMP) (30 days after contract award) • Labour Management Plan (LMP) • Specific management plans as per ESMP The Employer shall provide the following safeguard documents (link below) upon which the bidder shall prepare the afore stated documents https://www.zesco.co.zm/projects.php: • Environmental and Social Management Plan (ESMP) • Environmental and Social Impact Assessment (ESIA) • Stakeholder Engagement Plan (SEP) • Environmental and Social Commitment Plan (ESCP) • Labor Management Procedure (LMP) • Resettlement Action Plan (RAP) • Biodiversity Management Plan (BMP) m)Quality Assurance/Control Plans: The Contractor shall submit their programme of quality control and inspection procedures for the Project to assure that the Plant during design, manufacture, installation and on completion complies with the specified requirements. The programme shall relate 'quality control and inspection activities' to the 'production cycle'. In support of the quality control and inspection programme, the Contractor shall provide details of quality control and inspection procedures available for use in the execution of the Contract.

	The Contractor shall retain responsibility for quality control and inspection activities made by his sub-contractors and shall indicate on the programme which items are to be sub-contracted. n) Risk Assessment and Management Plan: Risks to manufacturing, shipment, transportation and construction, E&S aspects, engineering design, quality, costs, project cash flow, time schedule etc. The Bidder shall create a Table of Content for the documents required to comprise the Bid with a composition complying with the instructions in ITB 11 and BDS ITB 11.
ITB 11.3(d)	The Bidder shall submit the following additional documents in the Financial Part of its Bid: <i>N/A</i>
ITB 12.1	All costs for shared Preliminary Items and Site Offices for the Engineer for all three transmission lines are to be priced exclusively in the '330kV Kasama-Nakonde_Price Schedules' document. The corresponding items in the 400kV and 132kV schedules have a quantity of zero and must not be priced.
ITB 13.1	Alternative Bids <i>shall not be</i> considered.
ITB 13.2	Alternatives to the Time Schedule <i>shall not be</i> permitted.
ITB 13.4	Alternative technical solutions shall be permitted for the following parts of the Plant and Installation Services: <i>N/A</i> .
ITB 17.1	Bidders shall quote for the following components or services on a single responsibility basis: Design, Supply, and Installation for: i) Double circuit 330 kV Kasama-Nakonde overhead transmission line, 212km length, ii) Double circuit 400 kV overhead transmission line from Nakonde to the Tanzanian border, 15km length (charged at 330 kV), and iii) Double circuit 132 kV Isoka-Nakonde (loop in and out of 66 kV Isoka - Nakonde line) overhead transmission line, 13km length.
ITB 17.4	The Price Schedules are split in three parts, one for 132 kV Nakonde-Isoka, one for 330 kV Kasama-Nakonde and one for 400 kV Nakonde-Tanzanian border. A separate Price Schedule is provided for Grand Total Summary of the above mentioned parts, to be filled in by the Bidder.
ITB 17.5 (a) and (b)	Place of destination: KASAMA TO NAKONDE Final destination (Project Site): KASAMA TO NAKONDE Prices stated shall include transportation of Plant for transmission lines to the workplaces along the lines.
ITB 17.6	The Incoterms edition is: INCOTERMS 2020
ITB 17.7	The prices quoted by the Bidder <i>shall</i> be subject to adjustment during the performance of the Contract.
ITB 18.1	The Bidder <i>is</i> required to quote in the currency of the Employer's Country the portion of the Bid price that corresponds to expenditures incurred in that currency.
ITB 19.1	The Bid shall be valid until 180 days after the bid submission deadline date.
ITB 19.2 (a)	The Bid price shall be adjusted by the following factor(s): <i>N/A</i>

ITB 20.1	A Bid Security <i>shall not be</i> required. A Bid-Securing Declaration <i>shall be</i> required.
ITB 20(d)	Other types of acceptable securities: NONE
ITB 20.9	If the Bidder performs any of the actions prescribed in ITB 20.9 (a) or (b), the Borrower will declare the Bidder ineligible to be awarded a contract by the Employer for a period of Three (03) years starting from the date the Bidder perform any of the actions.
ITB 21.3	The written confirmation of authorization to sign on behalf of the Bidder shall consist of “Power of Attorney” (either notarized or attested by the appropriate authority in the Bidder’s home country) <u>along with a copy of relevant Board Resolution (if applicable).</u> Notes: (a) The Power of Attorney shall indicate that the person signing the Bid has the authority to sign the Bid and the Bid is binding upon the Bidder during the full period of its validity. (b) In the case of Bids submitted by an existing or intended JV, an undertaking signed by all parties (i) stating that all parties shall be jointly and severally liable, if so required in accordance with ITB 4.1, and (ii) nominating representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution. ➤ All the conditions of ITB 21.3 will be applicable. Authorization letter must be on official letterhead of the bidder’s company
D. Submission and Opening of Bids	
ITB 22.1	In addition to the original Bid, the number of copies is: Three (3). Notes: (a) Electronic copies of the bid (PDF format) shall also be submitted on a USB flash drive with appropriate password protection/encryption, malware scanning, and integrity (hash) of electronic copies (bidder will only provide the password at the time of bid opening). The electronic copy shall be structured in the same way as the printed edition of the Bid. Searchable PDF and signed scanned PDF shall be included in the submittal. (b) The price schedule and technical schedule in MS-Excel format shall be submitted. (bidder will only provide the password at the time of bid opening). (c) Electronic copies shall preserve the two-envelope process. The Bidder shall submit the Technical Part and Financial Part in separate encrypted folders/files/media. The password for the Technical Part may be disclosed at the public opening of Technical Parts. The password for the Financial Part shall be disclosed only at the second public opening of Financial Parts for those Bidders whose Technical Parts are found substantially responsive. In case of discrepancies, the “ORIGINAL” hardcopy will take precedence over the electronic version. Notes: Copies of the Technical Part shall be placed in a separate sealed envelope marked “Copies: Technical Part”. Copies of the Financial Part shall be placed in a separate sealed envelope marked “Copies: Financial Part”.
ITB 23.1	For <u>Bid submission purposes</u> only, the Employer’s address is: Attention: <i>Head Procurement</i> Street Address: <i>Stand No. 6949, Great East Road</i>

	Floor/ Room number: <i>Procurement Offices, ZESCO Head Quarters</i> City: <i>LUSAKA</i> ZIP/Postal Code: <i>10101</i> Country: <i>ZAMBIA</i> The deadline for Bid submission is: Date: 21 August 2026 Time: <i>10:30AM CAT</i> Bidders <i>shall not</i> have the option of submitting their Bids electronically. The electronic Bidding submission procedures shall be: <i>N/A</i>											
E. Public Opening of Technical Parts of Bids												
ITB 26.1	The Bid opening shall take place at: Street Address: <i>Stand No. 6949, Great East Road</i> Floor/ Room number: <i>Procurement Offices, ZESCO Head Quarters</i> City: <i>LUSAKA</i> Country: <i>ZAMBIA</i> Date: 21 August 2026 Time: <i>10:30AM CAT</i> The electronic Bid opening procedures shall be: <i>N/A</i>											
ITB 26.6	The Letter of Bid – Technical Part and the sealed envelope marked “Second Envelope: Financial Part” <i>shall</i> be initialed by representatives of the Employer conducting Bid opening. The Financial Parts submitted will not be opened at this Stage. <i>Each Bid shall be initialed by all representatives and shall be numbered.</i>											
G. Evaluation of Technical Part of Bids												
ITB 32.2	The weighting to be given for Rated Criteria (including technical and non-price factors) is: 50% The technical factors and sub-factors, which for purposes of this document carry the same meaning as Rated Criteria and the corresponding scores in % are: <table border="1"> <thead> <tr> <th>Item No.</th><th>Technical Factor</th><th>Weight factor W_j [%]</th><th>Split Weight factor [%]</th></tr> </thead> <tbody> <tr> <td>1</td><td> Guaranteed Technical Schedules (List of deviations, if any, will also be assessed; evaluated based on compliance with Employer's Requirements and Guaranteed alignment Technical Schedules (GTS) alignment for specific technical data of key equipment and facilities. Deviations (if any) clearly tabulated and justified for assessment) </td><td>10</td><td></td></tr> </tbody> </table>				Item No.	Technical Factor	Weight factor W_j [%]	Split Weight factor [%]	1	Guaranteed Technical Schedules (List of deviations, if any, will also be assessed; evaluated based on compliance with Employer's Requirements and Guaranteed alignment Technical Schedules (GTS) alignment for specific technical data of key equipment and facilities. Deviations (if any) clearly tabulated and justified for assessment)	10	
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	2	Project Management	45	
	2.1	Site Organization (Assess structure, roles, and oversight; score based on clarity and fit for 330kV transmission lines)		5
	2.2	Method Statement for Design, Procurement, Shipment and Construction		
	2.2.1	Pre-Execution Methodologies (Survey Works and Design Engineering. Detail approach to geotechnical surveys, foundation designs, structural, stringing, and electrical engineering; include risk assessment for terrain)		10
	2.2.2	Testing and Supply Methodologies (Factory Acceptance/Type Tests and Supply of Equipment/Materials; Detail approach for the Factory Acceptance Tests and Type Tests (if not available beforehand), and outline for procurement, manufacturing, shipment, customs, FAT/SAT plan, and input resources from OEM's work to site; integrate timelines and quality checks)		10
	2.2.3	Execution and Commissioning Methodologies (Civil & Electrical Installation Works, and Commissioning of Plant & Facilities; Assessing civil and electrical works, tower erection, stringing, jointing, welding, and commissioning; include sequencing and milestones)		10
	2.2.4	Supply Chain Risk Management and Quality Assurance Plan (Detailed risk matrix, risk probability with impact scores, Alternative qualified supplier, QA procedures, QC methodology, (Third Party) Audit, Environmental, Social, Health, and Safety integration under ESF).		5
	2.2.5	Methodology for Involvement of Local Subcontractors, Suppliers and Personnel and Women-owned Businesses (WOB) (Use of locally sourced materials (Zambian-registered SMEs, WOB, Zambian workforce, aggregates, cement, non-specialized steel (not for tower and forced structure), capacity building program for local firms)		5
	3	Mobilization Schedule (Assess realism and completeness, integration with construction critical paths)	5	
	4	Construction Schedule (Covering all the details as mentioned in the Construction Schedule Form under section IV – Bidding Forms; Evaluate critical paths, milestones, and resource integration)	5	
	5	Environmental, Social, Health and Safety Strategy	15	
	5.1	Environmental Strategy Demonstrated by the Bidder (ESMSIP that meets key ESMP requirements and demonstrates specific measures to protect the sensitive Euphorbia habitat at Mwela Rocks. ESMSIP includes: biodiversity protection for both flora and fauna, especially for Euphorbia habitat, bird-collision risk mitigation, waste management, pollution		5

		control, fuel oil handling and containment spill prevention/response, and noise management for construction machines.)		
	5.2	Social Strategy Demonstrated by the Bidder (A clear Social Management Strategy addressing key social risks, especially community engagement, GRM and strong GBV/SEAH prevention and response measures. The Strategy also outlines traffic and road safety during heavy-haul movements, and as well as mitigation for dust and noise impacts.)		5
	5.3	Health and Safety Strategy Demonstrated by the Bidder (A clear OHS strategy that meets compliance requirements, includes risk assessment, disease prevention and vaccination, PPE and safety tools, hygiene measures, emergency response procedures, and worker training.)		5
	6	Adequacy of Resources (Equipment and Personnel) Allocation for Design and Construction Stage Activities	20	
	6.1	For Project Manager (CVs, certifications, resource allocation plan)		5
	6.2	For the rest of the Personnel (CVs, certifications, resource allocation plan)		10
	6.3	Proposed Equipment (Access equipment lists, tower erection cranes, gin pole, tensioners, drum winches, resource allocation plan etc., specified in Section III)		5
		TOTAL	100	
The Technical Part Scoring Methodology is specified in Section III – Evaluation and Qualification Criteria. For the “Technical Part”, a minimum ‘Total Technical Part Score (T)’ required to pass is 60% (Sixty Percent). Note: The “Financial Part” of the Bids will be publicly opened only of those Bidders who will be considered substantially responsive according to ITB 30.1 and passed the aforesaid minimum threshold.				
H. Notification of Evaluation of Technical Parts and Public Opening of Financial Parts				
ITB 33.5	The Letter of Bid – Financial Part and Schedules shall be initialled by three (03) representatives of the Employer conducting Bid opening. <i>Each Financial Part of Bid shall be initialled by three (03) representatives of the Employer and shall be numbered.</i> In addition to the bid opening procedure specified in ITB 33.5, the Letter of Bid and price schedules of each bid shall be initialled by the member of the Employer’s Bid Opening Committee who are present at the time of bid opening. Any inter-lineation, erasures, or overwriting that were already made by the bidder prior to the bid submission deadline, which shall be valid only if signed or initialled by the person signing the bid, shall also be initialled by member of the Employer’s Bid Opening Committee who are present at the time of bid opening.			
I. Evaluation of Financial Part of Bids				
36.1(f)	The adjustments shall be determined using the following criteria, from amongst those set out in Section III, Evaluation and Qualification Criteria:			

	(a) Deviation in Time for Completion: 2% of Bid Price for each month above the period stated in PCC 8.2 for evaluation purposes; (b) Life cycle costs: the projected operating and maintenance costs during the life of the Facilities No; (c) Functional Guarantees of the Facilities No; (d) Work, services, facilities, etc., to be provided by the Employer No;
ITB 36.2	The currency that shall be used for Bid evaluation and comparison purposes to convert (at the selling exchange rate) all Bid prices expressed in various currencies into a single currency is: United States Dollars (USD) The source of exchange rate shall be: OANDA www.oanda.com The date for the exchange rate shall be: 28 days prior to the deadline for submission of the Bids.
J. _____ Evaluation of Combined Technical and Financial Parts and Most Advantageous Bid	
ITB 39.1	The weight to be given for cost is: 50%
K. Award of Contract	
ITB 48.1	The procedures for making a Procurement-related Complaint are detailed in the "The World Bank Procurement Regulations for IPF Borrowers : Procurement in Investment Project Financing - Goods, Works, Non-Consulting and Consulting Services - "Seventh Edition" (September 2025)." If a Bidder wishes to make a Procurement-related Complaint, the Bidder should submit its complaint following these procedures, in writing (by the quickest means available, that is either by email or fax), to: For the attention: <i>Lemmy Nyirenda</i> Title/position: <i>Procurement Specialist</i> Employer: <i>ZESCO Limited</i> Email address: <i>lnyirenda@zesco.co.zm</i> In summary, a Procurement-related Complaint may challenge any of the following: 1. the terms of the Bidding Documents; and 2. the Employer's decision to award the contract.

Section III – Evaluation and Qualification Criteria

(Without prequalification)

This section contains all the criteria that the Employer shall use to evaluate Bids and qualify Bidders. No other factors, methods or criteria shall be used other than specified in this Bidding document.

The Bidder shall provide all the information requested in the forms included in Section IV, Bidding Forms.

Wherever a Bidder is required to state a monetary amount, Bidders should indicate the USD equivalent using the rate of exchange determined as follows:

- For turnover or financial data required for each year - Exchange rate prevailing on the last day of the respective calendar year (in which the amount for that year is to be converted) was originally established.
- Value of single contract - Exchange rate prevailing on the date of the contract.

Exchange rates shall be taken from the publicly available source identified in the ITB 36.2. Any error in determining the exchange rates in the Bid may be corrected by the Employer.

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It is hereby stipulated that the following items are to be construed as representative, but not exhaustive, of the documentation required to be submitted by the Bidder in accordance with the terms and conditions of this Bidding Document.	
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1. Qualification

1.1 Qualification Requirements

The Bidder's qualifications shall be assessed in accordance with the Qualification table included in this section.

1.2 Contractor's Representative and other Key Personnel

The Bidder must demonstrate that it will have suitably qualified Contractor's Representative and other suitably qualified (and in adequate numbers) key personnel, as described in the Employer's Requirements.

The Bidder shall provide details of the Contractor's Representative and other key personnel, and such other key personnel that the Bidder considers appropriate, together with their academic qualifications and work experience. The Bidder shall complete the relevant Forms in Section IV, Bid Forms.

Copies of qualifications for key personnel shall be provided together with the bid.

Minimum Qualifications for Key Personnel

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
1.	Contractor's Representative	Bachelor's Degree in Engineering/ Law/ Procurement/ Business administration/ project management/ International Relations Or Equivalent	<i>Not less than ten (10)</i>	Managing international contracts with specific experience: a) Engineering or b) Procurement or c) Business administration and d) Managing international turn-key contracts in the power sector
2.	Project Manager	At least a Degree in Electrical/ Civil/ mechanical engineering/ project management or other similar degree in engineering	<i>Not less than ten (10)</i>	a) The designing, managing, and supervising works related to the power transmission system b) At least three (3) successfully completed overhead transmission line projects of 330kV and above as a similar roles (e.g., PM, Deputy PM). c) Above project experiences should include at least two (2) international experience in similar roles.
3.	Construction Site Manager	At least a Bachelor's Degree in Electrical/ Electro-mechanical engineering/ Civil engineering/ project management	<i>Minimum of ten (10)</i>	a) At least two (2) successfully completed international turnkey overhead transmission line projects of 330kV and above b) Above project experiences should include site supervision, plant engineering design, supply, installation, testing, and commissioning.

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
4.	Contract Manager	Bachelor's Degree in Engineering/ Law/ Procurement Or Equivalent	<i>Not less than ten (10)</i>	a) At least two (2) similar procurement and managing international turn-key contracts and/or civil contracts.
5.	Telecommunication (OPGW installation) Engineer	Bachelor's Degree in Electronics/ Telecommunications	<i>Not less than ten (10)</i>	a) The design, testing and commissioning of OPGW projects b) Similar three (3) successfully completed projects
6.	Site Engineer – Civil and Erection Works	Bachelor's Degree in Civil/ Construction Engineering	<i>Not less than ten (10)</i>	a) Transmission line design and construction supervision for voltages including 330 kV and above. b) Above project experiences should <i>include at least two (2) international experience in similar roles</i>
7.	Structural Engineer	Bachelor's Degree in Civil/ Mechanical Engineering	<i>Not less than ten (10)</i>	a) Transmission line design and construction supervision for voltages including 330 kV and above. b) Knowledge and experience: i) Structural analysis; and ii) Tower/pole design c) Above Knowledge and experience should include design software packages
8.	Geotechnical/Foundations Design Expert:	University degree in Geotechnical Engineering	<i>Minimum eight (8)</i>	• Steel structure design • Quality control • Full scale structure testing, design of tower foundations

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
	Geotechnical Engineer			- Electrical apparatus foundations; and - Project completion experience - Three (3) successfully completed overhead transmission line projects including 330kV and above - Above projects should include at least one (1) international project.
9.	Transmission Line Design Engineer	Bachelor's Degree in Electrical/ Structural/ Civil Engineering	<i>General:</i> <i>Not less than ten (10)</i> <i>Specific:</i> <i>Minimum of seven (7)</i>	General Experience - Transmission line design, and/or construction supervision - At least three (3) successfully completed projects. Specific Experience - Above successful completed projects should include at least two (2) projects at voltage level of 330kV or higher in Plant Engineering Design Knowledge and experience - Tower spotting; and - Line profiles using PLSCADD or equivalent design software. Advantage Experiences - Voltage level of 400 kV and above.
10.	Geomatic or Surveying Engineer	Bachelor's Degree in Geomatic Or Survey Engineering	<i>Not less than eight (08)</i>	- Transmission line survey (GPS, Total station, AutoCAD and GIS software) including route surveying, data collection and analysis.

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
11.	Quantity Surveyor	Bachelor's Degree in Quantity Surveying Or Related Construction Engineering studies.	<i>Not less than five (05)</i>	a) Heavy industrial construction Added advantage experience: b) Transmission lines construction in energy sector.
12.	Commissioning Engineer	University degree in Electrical Engineering.	<i>Minimum of eight (8)</i>	a) Relevant work experience b) Commissioning of OHTL at least 3 successfully completed projects of a similar nature and complexity c) At least one of the above projects should be international project.
13.	Quality Control Engineer as QC/QA Manager	University degree in Engineering		a) Relevant work experience b) At least three successfully completed transmission line project at voltage level 330 kV c) At least one of the above project should be international project. Advantage experience a) Experience of higher voltage than 330kV
14.	Environmental, Health and Safety (EHS) Manager	Management, Public Health, Environmental Engineering, Occupational Health and Safety. Or Related field.	<i>Minimum of ten (10) years</i>	a) EHS management of construction or large infrastructure projects, transmission line projects, or linear projects, including high voltage works, working at heights, and heavy machinery. b) Managing multidisciplinary EHS teams and preparing EHS reports to demonstrate strong supervisory and coordination skills Knowledge/Capability/Skill a) Ability to develop, review, and implement ESMPs & OHS Plans.

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
	(Team Management Level)	- Formal training in accident/incident investigation. Preferred: Master's degree in a relevant field. Advantage: Professional certifications, such as i) NEBOSH, ii) IOSH, iii) ISO 14001 Implementation or Lead Auditor, - ISO 45001 Implementation or Lead Auditor.		b) Strong knowledge of national environmental regulations and OHS legislation, as well as international standards, including: i) World Bank Environmental and Social Standards (ESS) 1 to 10, ii) World Bank Environmental Health and Safety Guidelines (EHSs), and iii) World Bank Gender Strategy 2024-2030. c) Accident/incident investigation and training d) Fluency in English Advantage: a) Implementing international safeguards systems such as World Bank Environmental and Social Safeguards, IFC Performance Standards, AfDB Integrated Safeguards System, or equivalent. b) Working on large infrastructure projects with experience in Environmental and Social Impact Assessment (ESIA), and implementing ESMPs, CESMPs, BMPs, RAPs, Grievance Redress Mechanisms, Labour Management Plans/Procedures and other relevant E&S instruments. c) Experience working with gender mainstreaming and in managing Sexual Exploitation, Abuse and Harassment issues on similar projects.
15.	Environmental Officer	Bachelor's degree in Environmental Management, Natural Resources Management,	<i>Minimum of eight (8) years</i>	a) Environmental or sustainability management for large construction or infrastructure projects. Knowledge/Capability/Skill

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
		Environmental Science, Ecology. Or Related field. Advantage: i) Master's degree in a relevant field. ii) Certificate in Environmental Auditing or Monitoring, Certificate in ISO 14001 Implementation or Lead Auditor		a) Strong knowledge of national environmental regulatory frameworks, including Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plans (ESMPs). b) Ability to conduct field sampling, environmental monitoring, data analysis, and reporting. c) Sound understanding of vegetation management and soil and water protection measures. d) Good knowledge of World Bank Environmental and Social Framework (ESF), particularly i) ESS3 (Resource Efficiency & Pollution Prevention and Management) ii) ESS6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources.) e) Fluency in English Advantage a) Working on large infrastructure projects, with linear projects (e.g. transmission lines and roads), with experience in Environmental and Social Impact Assessment (ESIA), and implementation of ESMPs, CESMPs, BMPs and other relevant E&S instruments. b) Implementing international safeguards systems such as World Bank Environmental and Social Safeguards, IFC Performance Standards, AfDB Integrated Safeguards System, or equivalent .

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
16.	Health and Safety Officer (HSO)	Degree or diploma in Occupational Health and Safety, Industrial Safety, Engineering, Or Related fields. • Alternatively: OSHA certification or NEBOSH IGC. • Formal training in accident/incident investigation. Advantage: i) Certificate in ISO 45001 Lead Auditor ii) Certificate in ISO 45001 Implementation	<i>OHS:</i> <i>Minimum of eight (8)</i> <i>OHS under High-risk infrastructure:</i> <i>Minimum of three (3)</i>	a) Occupational health and safety management for construction or large infrastructure projects b) High-risk infrastructure works (e.g., transmission lines, substations, power plants, or major civil works). c) Managing high-risk activities associated with substation works, including high-voltage electrical systems, working at heights, fall protection, live-line or energized equipment, lifting and rigging, traffic safety, and emergency response. Knowledge/Capability/Skill a) Strong knowledge of national OHS laws and local labour and health regulations, Project ESIA/ESMP requirements, and World Bank Group EHS Guidelines. b) Ability to conduct daily safety inspections, hazard identification, prepare and implement Safe Work Method Statements (SWMS), and carry out incident investigations, including root cause analysis (RCA). c) Ability to deliver OHS training and inductions, maintain safety records, and prepare incident and compliance reports. d) Good understanding of the World Bank Environmental and Social Framework (ESF), particularly i) ESS2 (Labor and Working Conditions) and ii) ESS4 (Community Health and Safety). e) Fluency in English Advantage

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
				a) Working on large infrastructure projects with experience in implementation of CESMPs, Health and Safety Management Plans, Labour Management Plans, and other relevant E&S instruments. b) Strong knowledge of OSHA principles and ILO standards.
	Community Liaison Officer (CLO)	• <u>Bachelor's degree in Sociology, Development Studies, Social Work, Community Development, Anthropology, or related social sciences.</u> • <u>Alternatively: A diploma in the above fields plus 5 additional years of relevant field experience.</u>	<u>Minimum of eight (8) years of demonstrated experience in community engagement for large infrastructure projects (power transmission lines, roads, water, mining, or similar).</u>	[Evaluation Criteria] a) Knowledge of: - National Social and Community laws and regulations - Environmental and Social Impact Assessment (ESIA) Process - Environmental and Social Management Plans (ESMP) requirements b) Knowledge and understanding of the World Bank: - Environmental and Social Framework (ESF) - Environmental and Social Safeguards (ESS) under the ESF, Especially, - ESS10: Stakeholder Engagement and Information Disclosure - ESS4 – Community Health and Safety c) Experience with - Management of social issues in large construction or infrastructure projects, (including transmission lines and roads) - Implementing and supporting project and community Grievance Redress Mechanism (GRM) processes. - Development and implementation of Stakeholder Engagement Plans (SEP) - Documentation of grievances and maintenance of follow-up logs.

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
				v) Community engagement and working with rural or project-affected communities. vi) Understanding of cultural norms, traditional leadership structures, and community dynamics. vii) Preparation of clear reports and community meeting notes. viii) Fluency in English Language. ix) Fluency in local language(s) (Bemba). x) Working experience in Zambia or the Region (Sub-Saharan Africa) d) Advantage Experience: i) Demonstrated experience in implementing and applying the World Bank Environmental and Social Safeguards, IFC Performance Standards, AfDB Integrated Safeguards System, or similar standards in projects. ii) Preparation and implementation of Resettlement Action Plans (RAP) [Key Responsibilities] Primary link between the contractor and project-affected communities; manages community engagement and grievance processes. i) The CLO must be a field-based professional skilled in communication, local engagement, and grievance management. They serve as the day-to-day interface between the contractor and communities. ii) Implement the Stakeholder Engagement Plan (SEP). iii) Manage the community-level GRM (receive, record, follow-up grievances).

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
				iv) Conduct community meetings and awareness sessions on construction activities. v) Provide timely notices of outages, blasting, traffic changes, and work schedules. vi) Maintain records of community concerns and resolutions. vii) Identify community risks and escalate to Social/Gender Officer. viii) Support land access coordination (non-valuation). i. Facilitate community GBV/SEA/SH awareness messaging.
18.	Social and Gender Officer (SGO)	• Bachelor's degree in Gender Studies, Sociology, Development Studies, Social Sciences, or related discipline. • Master's degree in a relevant field is an advantage (not mandatory). • Formal training in GBV/SEA/SH mitigation, protection, or safeguarding is an added advantage.	• Minimum eight (8) years of experience in social safeguards, gender programs, or social risk management. • Minimum two (2) years of experience with donor-funded infrastructure projects (World Bank, AfDB, MCC, EU, USAID, etc.) is highly preferred.	[Evaluation Criteria] a) Knowledge of: i) Zambian Gender, GBV, Labour, and Social laws and regulations ii) Environmental and Social Impact Assessment (ESIA) Process. iii) Environmental and Social Management Plans (ESMP) requirements. b) Knowledge and understanding of the World Bank: i) Environmental and Social Framework (ESF) ii) Environmental and Social Safeguards (ESS) under the ESF, Especially: - ESS2 – Labor & Working Conditions (worker protection, labor risks, SEA/SH) - ESS4 – Community Health and Safety (SEA/SH, GBV, community impacts) - ESS5 – Land Acquisition / Resettlement (vulnerable groups, gender impacts) - ESS10 – Stakeholder Engagement (gender-responsive engagement)

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
				iii) Understanding of the World Bank Gender Strategy 2024-2030 iv) Understanding of all applicable laws relating to gender and GBV. c) Experience with: i) Management of social issues in large construction or infrastructure projects, (including transmission lines and roads). ii) Developing and implementing ESIAs, ESMPs, CESMP and Stakeholder Engagement Plans (SEP) iii) Preparation and implementation of Resettlement Action Plans (RAP) iv) Implementing and supporting project and community Grievance Redress Mechanism (GRM) processes. v) Preparation and implementation of anti-GBV / SEAH and Gender Action Plans. vi) Conducting training workers and local groups on social topics, GBV/SEA/SH, Codes of Conduct, and reporting protocols. vii) Social risk monitoring of labour conditions (child labour, forced labour), excluding technical safety. viii) Conducting social assessments, collection of sex-disaggregated data, and preparation of reports ix) Supporting women, youths, and persons with disabilities inclusion in employment, training, and project benefits. x) Knowledge of relevant local language(s) (Bemba) is a strong asset. xi) Working experience in Zambia or the Region (Sub-Saharan Africa). xii) Fluency in English Language d) Advantage Experience:

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
				i) Demonstrated experience in implementing and applying the World Bank Environmental and Social Safeguards, IFC Performance Standards, AfDB Integrated Safeguards System, or similar standards in projects [Key Responsibilities] Ensure compliance with social safeguards and gender requirements; manage social risks and gender-based actions. i) The SGO ensures compliance with all social and gender requirements, leads GBV/SEA/SH prevention, monitors labor conditions, trains workers, and provides safeguards reporting to the Engineer and the PIU. ii) Ensure the contractor complies with relevant social safeguards under the World Bank ESF (ESS2, ESS4, ESS5, ESS10). iii) Lead implementation of the Gender Action Plan and SEA/SH Prevention and Response Action Plan. iv) Conduct worker onboarding and regular training on anti-GBV/SEA/SH, code of conduct, labour rights, GRM, and inclusive workplace practices. v) Monitor worker conditions including labour influx, child labour, forced labour risks, and worker accommodation standards. vi) Promote inclusion of women, youths and persons with disabilities in employment, training, and supplier opportunities. vii) Monitor and report on social indicators, grievances (from the CLO), and compliance in monthly and quarterly ESMP reports. viii) Ensure the contractor implements socially responsible labor practices and corrects non-compliances.

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
				Coordinate closely with the CLO on grievances involving vulnerable groups, SEA/SH cases (referral pathways only), and community risk trends.
19.	Bio-diversity Expert	Bachelor's Degree in Ecology, Forestry, Natural Resource Management, Environment studies, Or An equivalent field.	<i>Minimum of five (5) years</i>	a) Environmental management in large infrastructure projects (Transmission lines, roads, energy, or linear projects) b) Biodiversity Management Plans (BMPs), ESIA's, ESMPs, CESMPs and other relevant instruments development and implementation. c) Implementing and applying the World Bank Environmental and Social Safeguards to experienced projects. Knowledge/Capability/Skill a) The World Bank's Environmental and Social Framework b) Good knowledge of World Bank Environmental and Social Framework (ESF), particularly ESS6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources.) c) Fluency in English. Advantage: Implementing international safeguards systems such as World Bank Environmental and Social Safeguards, IFC Performance Standards, AfDB Integrated Safeguards System, or equivalent
20.	Archaeologist	Bachelor's Degree in Archaeology,	<i>Minimum eight (8) years</i>	a) Completing field surveys to identify and document archaeological sites particularly in large infrastructure projects b) Cultural Heritage Management Plans (CHMP), ESIA's, ESMPs, CESMPs and other relevant instruments development and implementation.

S/N	Position/ specialization	Relevant academic qualifications	Years of relevant work experience	Minimum relevant work experience and/or knowledge
		Anthropology, Cultural Heritage Management, Or A related field.	.	c) Cultural heritage assessments, Chance Find and Procedures, and relevant fieldwork d) Applying the World Bank's Environmental and Social Framework Knowledge/Capability/Skill a) Strong understanding of local laws and regulations regarding cultural heritage. b) Good knowledge of the World Bank Environmental and Social Framework (ESF), particularly ESS8 (Cultural Heritage). c) Knowledge of relevant local language(s). d) Fluency in English. Advantage: a) Implementing international safeguards systems such as World Bank Environmental and Social Safeguards, IFC Performance Standards, AfDB Integrated Safeguards System, or equivalent

1.3 Equipment

The Bidder must demonstrate that it will have access to the key equipment required to perform the contract.

S/N	Description	Minimum Qty
1	Excavator	6
2	Tipper Truck - 30 Ton	6
3	Crane, minimum 50 Ton	4
4.1	Stringing Machine (Pulling and Breaking Machine Sheaves for Puller & Tensioner) for bundled conductors – Capacity [15] tons	4
4.2	Stringing Machine (Pulling and Breaking Machine Sheaves for Puller & Tensioner) for OPGW – Capacity [6] tons	4
5	Low Bed	2
6	10 Ton Truck (Material Transportation)	4
7	Concrete Mixer	6
8	Conductor Crimping Tools	8
9	Light Vehicles	6
10	Gin pole (particularly for Euphorbia segment constraint)	8
11	Front End Loader	4
12	Manual wire-rope hoists (Grip hoist) - Capacity ≥ 1.5 tons	2
13	Lever chain Hoist - Capacity ≥ 1.5 tons, Qty	8
14	Crane-on-Tower for heavier picks after the manual gin-pole completes the initial steel	1
15	Batching Plant	2

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

1.4 Subcontractors/Manufacturers

Subcontractors/manufacturers for major items of supply or services identified in the table below must meet or continue to meet the minimum criteria specified therein for each item and MUST demonstrate this requirement in the submitted bids.

Subcontractors for the following additional major items of supply or services must meet the following minimum criteria, herein listed for that item:

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
1.	Steel Towers	<u>Supply record</u> a) Ten (10) yrs b) Total includes supplies outside the manufacturer's country below. <u>Specific supply record: Outside the manufacturer's country</u> a) Five (5) yrs supply record b) Performance certificate is required (At least two (2)). c) Reference list as the evidence for the required period of time should include (i) supplied tower (type and quantities or tons), (ii) project designation, and (iii) year of supply <u>Experience</u> a) Within the last ten (10) yrs b) At least three (3) similar project c) Design, manufacture, and supply of towers for similar nature, complexity, and quantity projects including 330kV voltage level. d) Reference list as evidence for the required period of time should include (i) supplied tower (type and quantities or tons), (ii) project designation, (iii) voltage level, (iv) year of supply, and (iv) end user certificates for the projects. e) 400kV and above voltage are advantage. <u>Manufacturing Capacity</u> a) Quantity: At least 2,500 tons / month b) Proof of production capacity to be provided. <u>ISO Certificate (Current)</u> (a) Two (2) (b) ISO 9001 or equivalent certification (c) ISO 45001 or equivalent certification
2.	Phase Conductors (ACSR Bluejay, Bison & Wolf)	<u>Supply record</u> a) Ten (10) yrs b) Total includes supplies outside the manufacturer's country below. c) Reference list as the evidence for the required period of time should include (i) supplied conductor quantities (type and length), (ii) project designation, and (iii) year of supply <u>Specific supply record: Outside the manufacturer's country</u> a) At least Five (5) yrs b) Five (5) Performance certificates is required. c) Reference list as the evidence for the required period of time should include (i) supplied conductor quantities (type and length), (ii) project designation, and (iii) year of supply

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
		<u>Operation Record</u> a) At least five (5) yrs b) Five (5) Performance certificates c) Installed and in service d) Outside the country of the manufacturer e) Evidenced by performance certificates <u>Conductors Amount</u> a) Quantity: 10,000km (Minimum) b) Transmission line conductors <u>Specific Conductors Amount (Bluejay, Bison, or Wolf)</u> a) Within seven (7) yrs b) Quantity: 3,000km c) Manufacturing and supply d) Reference list as the evidence for the required period of time should include (i) supplied conductor quantities (type and length), (ii) project designation, and (iii) year of supply. <u>Manufacturing Capacity</u> a) Quantity: 4,000 tons/month <u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification <u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
3.	Phase Conductor Fittings including joints, spacers and dampers	<u>Supply record</u> a) Ten (10) yrs b) Total includes supplies outside the manufacturer's country below. <u>Specific supply record: Outside the manufacturer's country</u> a) At least Five (5) yrs b) Five (5) Performance certificate is required. c) Evidence for supply records <u>Operation Record</u> a) At least five (5) yrs b) Five (5) Performance certificate c) Installed and in service. d) Outside the country of the manufacturer

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
		e) Evidenced by performance certificates <u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification <u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
4	OPGW	<u>Supply record</u> a) Ten (10) yrs b) Total includes supplies outside the manufacturer's country below. <u>Specific supply record: Outside the manufacturer's country</u> a) At least Five (5) yrs b) Five (5) Performance certificate are required. c) Reference list as the evidence for the required period of time should include (i) supplied OPGW quantities in km, (ii) type of OPGW, (iii) project designation, and (iv) year of supply. d) Evidence for supply records <u>OPGW Amount</u> a) In the last ten (10) yrs b) 10,000km (Minimum) c) Evidence for supply records <u>Operation Record</u> a) At least five (5) yrs b) Five (5) Performance certificate c) Installed and in service d) Outside the country of the manufacturer e) evidenced by performance certificates <u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification <u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
		c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
5.	OPGW Fittings	<u>Supply record</u> Ten (10) yrs Total includes supplies outside the manufacturer's country below.
		<u>Specific supply record: Outside the manufacturer's country</u> At least five (5) yrs Five (5) Performance certificate is required. Evidence for supply records
		<u>Amount</u>
		<u>Operation Record</u> a) At least five (5) yrs Installed and in service b) Outside the country of the manufacturer evidenced by performance certificates c) Five (5) Performance certificate
		<u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification
		<u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
6.	FO junction boxes	<u>Supply record</u> a) Ten (10) yrs b) Total includes supplies outside the manufacturer's country below.
		<u>Specific supply record: Outside the manufacturer's country</u> a) At least five (5) yrs b) Performance certificate is required. c) Five (5) Performance certificate d) Evidence for supply records
		<u>Amount</u> N/A
		<u>Operation Record</u> a) At least five (5) yrs

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
		b) Installed and in service c) Outside the country of the manufacturer evidenced by performance certificates d) Five (5) Performance certificate <u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification <u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
7.	Insulator for tension and suspension strings	<u>Manufacturing Business operation</u> a) At least ten (10) yrs b) At least one of three documents should be provided; i) Business registration document; ii) Articles of incorporation; iii) Tax registration document <u>Operation Record</u> a) At least five (5) yrs b) [30,000] pieces c) Used at 220kV voltage level or above d) Installed and in service outside the country of manufacturer. e) Five (5) Performance certificates should be provided as the evidence: f) Reference list as the evidence for the required period of time should include (i) supplied insulator quantities in pieces, (ii) voltage level, (iii) project designation, and (iv) year of supply. <u>Project experience outside the manufacturer's country</u> a) At least five (5) b) 330kV of similar size to this specific project c) 400kV and above voltage are advantage. d) Five (5) Performance certificates should be provided as the evidence. <u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
		<u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
8.	Insulator Fittings for tension and suspension strings	<u>Manufacturing Business operation</u> a) At least ten (10) yrs b) At least one of three document should be provided; i) Business registration document; ii) Articles of incorporation; and iii) Tax registration document <u>Operation Record</u> a) At least five (5) yrs b) Installed and in service outside the country of manufacturer. c) Performance certificates should be provided as the evidence <u>Project experience outside the manufacturer's country</u> a) 330kV or higher voltage of similar size to this specific project b) At least five (5) c) Performance certificates should be provided as the evidence. d) 400kV and above voltage are advantage. <u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification <u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
9.	Earth wire	<u>Supply record</u> a) Ten (10) yrs b) Total includes supplies outside the manufacturer's country below. <u>Specific supply record: Outside the manufacturer's country</u> a) Five (5) yrs b) Performance certificate is required.

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
		c) Five (5) Performance certificate <u>Operation Record</u> a) At least five (5) yrs b) Evidence for supply records c) Five (5) Performance certificate <u>Amount</u> N/A <u>ISO Certificate (Current)</u> Two (2) ISO 9001 or equivalent certification ISO 45001 or equivalent certification <u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test but this laboratory is not accredited.)
10.	Earth wire fittings	<u>Supply record</u> a) Ten (10) yrs b) Total includes supplies outside the manufacturer's country below. <u>Specific supply record: Outside the manufacturer's country</u> a) Five (5) yrs b) Performance certificate is required. c) Five (5) Performance certificate <u>Operation Record</u> a) At least five (5) yrs b) Evidence for supply records c) Five (5) Performance certificate <u>Amount</u> N/A <u>ISO Certificate (Current)</u> a) Two (2) b) ISO 9001 or equivalent certification c) ISO 45001 or equivalent certification <u>Type Test Certificate</u> a) Not more than eight (8) yrs b) Valid

Item No.	Description of Item (Major Equipment)	Minimum Criteria to be Met with Specific requirements
		c) Type Test should be certified by accredited laboratories complying with ISO / IEC 17025 (i.e. it is not acceptable even if a manufacturer laboratory has performed type test, but this laboratory is not accredited.)
11.	Subcontractor for foundation construction works	<u>Construction works & installation</u> a) In the last ten (10) yrs b) 330kV OHTL c) Two (2) d) Civil works include (i) excavation works, (ii) stub setting and concrete works; Specifically Civil works include (iii) experience in deep and tall foundations planted in large river crossings (including heavily flooded areas) involving piling technology. e) Concrete production capacity of at least 3,500 m ³ /month f) Certificates / references of satisfactory completion are required. g) 400kV and above voltage are advantage.
12.	Subcontractor for tower erection works	<u>Tower erection works</u> a) In the last ten (10) years b) Two (2) c) 330kV OHTL d) Certificates / references of satisfactory completion / End users' letters are required. e) 400kV and above voltage, and longer than 1,000m span are advantage.
13.	Subcontractor for stringing works	<u>Stringing works</u> a) In the last ten (10) years b) Two (2) c) 330kV OHTL d) Certificates / references of satisfactory completion / End users' letters are required. e) 400kV and above voltage, and longer than 1,000m span are advantage

Document Submission Requirements

It is hereby stipulated that the following items are to be construed as representative, but not exhaustive, of the documentation required to be submitted by the Bidder in accordance with the terms and conditions of this Bidding Document.

- End users' letter
- Manufacturers' Authorization Letter (MAL)
- Reference list
- ISO certificates
- List of performed type tests

- Technical data sheets
- Drawings
- Catalogue

Note to Type Test Reports

- Where type test reports are not available, bidders should submit the written commitment format to perform tests at accredited labs, with stated timelines and contingency plans.
- Type test results must be traceable to the equipment offered, with matching type designations, drawings, and nameplate data.
- Pre-award undertakings will be referenced in the final contract documentation
- Failure to comply with this requirement will result in rejection of the subcontractor/manufacturers.

Manufacturer's Authorization Letter

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

In the case of a Bidder who offers to supply and/or install Plant and equipment under the contract that the Bidder did not manufacture or otherwise produce and/or install as per key equipment tables above, the Bidder shall provide the **Manufacturer's Authorization Letter (MAL)**, using the form provided in Section IV, showing that the Bidder has been duly authorized by the manufacturer or producer of the related Plant and equipment or component to supply and/or install that item in the Employer's country. The Bidder is responsible for ensuring that the manufacturer or producer complies with the requirements of **ITB 4** and **ITB 5** and meets the minimum criteria listed above for that item.

2 Evaluation of Technical Part

The total technical points assigned to each Bid in the Evaluated Bid Formula will be determined by adding and weighting the scores assigned by an evaluation committee to technical factors of the Bid in accordance with the criteria set forth below.

The technical factors to be evaluated are generally defined below and specifically identified in the **BDS**:

- (i) to what extent that the performance, capacity, or functionality features meet or exceed the levels specified in the performance / functional requirements and/or influence the life-cycle cost and effectiveness of the Plant;

- (ii) degree of 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 Technical Part of the Bid;
- (iii) quality of Technical Part in terms of risk assessment, method statement, key personnel, access to key equipment, work program and organization, and any other activities as specified by the Employer and based on the Bidder's experience;
- (iv) suitability of proposed subcontractors/manufacturers and completeness of required manufacturer's authorizations;
- (v) long-term availability of mandatory and recommended spare parts and maintenance services; and
- (vi) Any sustainable procurement requirement if specified in Section VII- Employer's Requirements.

Technical Part Scoring Methodology

Common Basis for Scoring Rated Technical Criteria

The rated technical criteria in this section (all factors and sub-factors) will be scored using a common six-level scale shown in the "Basis for Scoring Evaluation" table below and will be scored using a common 0–5 scale, with the corresponding percentage scores shown below. Evaluators will assign one integer score (0, 1, 2, 3, 4 or 5) to each rated item based on the evidence provided in the bid; fractional scores will not be used.

The scale measures (i) completeness of the information requested, (ii) conformity with the Employer's Requirements and the bidding documents, and (iii) quality and feasibility of the proposed approach. Each factor or sub-factor will first be placed in one of the six levels according to this table, and the numerical score within the range will be converted to the corresponding percentage and multiplied by the weight of that factor or sub-factor to obtain the weighted technical score. This common scale is used for all rated items to ensure consistency and transparency. Only features not already assessed on a pass/fail basis in Section III will be rated. Evaluators in Evaluation Committee will cite the relevant bid references and justification for each score and will apply the scale consistently across all bids, avoiding subjective language.

Basis for Scoring Evaluation

Score	Description of Scoring Criteria	Percentage Weightings for Point
0	Non-responsive: Fails mandatory requirements or presents material deviations; or the requested information is not provided.	0%
1	Weak: Meets the minimum requirement only on paper; evidence is incomplete or unclear; significant implementation risks.	20%

2	Adequate: Generally meets the critical requirement with acceptable evidence; only minor gaps or risks.	40%
3	Good: Fully meets the requirement in important aspects and is supported by robust, contract-specific evidence; low implementation risk.	60%
4	Strong: Substantially exceeds the requirement; approach or solution clearly demonstrates significant added value and risk reduction.	80%
5	Superior: Demonstrates a proven, superior approach or solution with clear, verifiable evidence from comparable projects; delivers material additional value to the Project.	100%

The score for each sub- factor (i) within a factor (j) will be combined with the scores of sub-factors in the same factor as a weighted sum to form the Factor Technical Score using the following formula:

$$S_j \equiv \sum_{i=1}^k t_{ji} * w_{ji}$$

where:

t_{ji} = the technical score for sub- factor “i” in factor “j”

w_{ji} = the weight of sub- factor “i” in factor “j”,

k = the number of scored sub-factors in factor “j”

and $\sum_{i=1}^k w_{ji} = 1$

The Factor Technical Scores will be combined in a weighted sum to form the total Technical Part Score using the following formula:

$$T \equiv \sum_{j=1}^n S_j * W_j$$

where:

S_j = the Factor Technical Score of factor “j”

W_j = the weight of factor “j” as specified in the BDS

n = the number of Factors

and $\sum_{j=1}^n W_j = 1$

TECHNICAL FACTORS AND SUB FACTORS

The technical factors (sub factors) to be evaluated and corresponding weight in % are given in table below:

Item No.	Technical Factor	Weight factor W_j [%]	Split of Weight factor W_j [%]
1	Guaranteed Technical Schedules (List of deviations, if any, will also be assessed; evaluated based on compliance with Employer's Requirements and Guaranteed alignment Technical Schedules (GTS) alignment for specific technical data of key equipment and facilities. Deviations (if any) clearly tabulated and justified for assessment)	10	
2	Project Management	45	
2.1	Site Organization (Assess structure, roles, and oversight; score based on clarity and fit for 330kV transmission lines)		5
2.2	Method Statement for Design, Procurement, Shipment and Construction		
2.2.1	Pre-Execution Methodologies (Survey Works and Design Engineering. Detail approach to geotechnical surveys, foundation designs, structural, stringing, and electrical engineering; include risk assessment for terrain)		10
2.2.2	Testing and Supply Methodologies (Factory Acceptance/Type Tests and Supply of Equipment/Materials; Detail approach for the Factory Acceptance Tests and Type Tests (if not available beforehand), and outline for procurement, manufacturing, shipment, customs, FAT/SAT plan, and input resources from OEM's work to site; integrate timelines and quality checks)		10
2.2.3	Execution and Commissioning Methodologies (Civil & Electrical Installation Works, and Commissioning of Plant & Facilities; Assessing civil and electrical works, tower erection, stringing, jointing, welding, and commissioning; include sequencing and milestones)		10
2.2.4	Supply Chain Risk Management and Quality Assurance Plan		5

	(Detailed risk matrix, risk probability with impact scores, Alternative qualified supplier, QA procedures, QC methodology, (Third Party) Audit, Environmental, Social, Health, and Safety integration under ESF).		
2.2.5	Methodology for Involvement of Local Subcontractors, Suppliers and Personnel and Women-owned Businesses (WOB) (Use of locally sourced materials (Zambian-registered SMEs, WOB, Zambian workforce, aggregates, cement, non-specialized steel (not for tower and forced structure), capacity building program for local firms)		5
3	Mobilization Schedule (Assess realism and completeness, integration with construction critical paths)	5	
4	Construction Schedule (Covering all the details as mentioned in the Construction Schedule Form under section IV – Bidding Forms; Evaluate critical paths, milestones, and resource integration)	5	
5	Environmental, Social, Health and Safety Strategy	15	
5.1	Environmental Strategy Demonstrated by the Bidder (ESMSIP that meets key ESMP requirements and demonstrates specific measures to protect the sensitive Euphorbia habitat at Mwela Rocks. ESMSIP includes: biodiversity protection for both flora and fauna on the project route (especially for Euphorbia habitat), bird-collision risk mitigation, waste management, pollution control, fuel oil handling and containment spill prevention/response, and noise management for construction machines.)		5
5.2	Social Strategy Demonstrated by the Bidder (A clear Social Management Strategy addressing key social risks, especially community engagement, GRM and strong GBV/SEAH prevention and response measures. The Strategy also outlines traffic and road safety during heavy-haul movements, and as well as mitigation for dust and noise impacts.)		5
5.3	Health and Safety Strategy Demonstrated by the Bidder (A clear OHS strategy that meets compliance requirements, includes risk assessment, disease prevention and vaccination, PPE and safety tools, hygiene measures, emergency response procedures, and worker training.)		5

6	Adequacy of Resources (Equipment and Personnel) Allocation for Design and Construction Stage Activities	20	
6.1	For Project Manager (CVs, certifications, resource allocation plan)		5
6.2	For the rest of the Personnel (CVs, certifications, resource allocation plan)		10
6.3	Proposed Equipment (Access equipment lists, tower erection cranes, gin pole, tensioners, drum winches, resource allocation plan etc., specified in Section III)		5
	TOTAL	100	
The Technical Part Scoring Methodology is specified in Section III – Evaluation and Qualification Criteria. For the “Technical Part”, a minimum ‘Total Technical Part Score (T)’ required to pass is 60% (Sixty Percent). Note: The “Financial Part” of the Bids will be publicly opened only of those Bidders who will be considered substantially responsive according to ITB 30.1 and passed the aforesaid minimum threshold.			

Detail Technical Factors (Rated Criteria)**1. Guaranteed Technical Schedules [10%]**

(List of deviations, if any, will also be assessed; evaluated based on compliance with Employer's Requirements and Guaranteed alignment Technical Schedules (GTS) alignment for specific technical data of key equipment and facilities. Deviations (if any) clearly tabulated and justified for assessment)

The Bidder shall provide the full set of guaranteed technical schedules required in the bidding documents, covering the targeted transmission lines, including towers, foundations, conductors/OPGW, fittings, insulators, testing, and delivery periods, and any other schedule specified in the bidding document. This factor is to confirm that the bidder has fully translated the Employer's Requirements (ER) into concrete, time-bound, and technically coherent commitments. This factor relates only to the content and quality of the technical schedules and does not re-assess bidder experience or construction programming.

The evaluation will mainly examine following aspects, but not limited to:

- Applicable schedules have been provided and are mutually consistent.
- Technical characteristics offered (e.g. tower types, conductor/OPGW types, hardware, foundations, type tests, testing arrangements) match what is specified in the ER or are clearly and acceptably qualified.
- Any proposed alternative technical solutions are clearly identified and technically demonstrated.

2. Project Management [45%]

This factor assesses how the bidder proposes to organize, plan, and control this contract, using contract-specific arrangements rather than generic corporate descriptions.

2.1. Site Organization [5%]

(Assess structure, roles, and oversight; score based on clarity and fit for 330kV transmission lines)

The bidder shall demonstrate a contract-specific site organization showing reporting lines from the Project Manager to construction teams, survey/design support, logistics/procurement interface, HSES, and local subcontractors. The description should indicate which functions are self-performed and which are subcontracted, and how reporting to ZESCO/Owner's Engineer (OE) will be done, to confirm that the structure is clear, sized for parallel work fronts, and able to control quality, safety, and progress.

2.2. Method Statement for Design, Procurement, Shipment and Construction [40%]

This is a contract-specific narrative and/or flow that shows how the bidder will move from pre-construction to commissioning, and how design/procurement will support site works. It has five parts.

2.2.1. Pre-Execution Methodologies [10%]

(Survey Works and Design Engineering. Detail approach to geotechnical surveys, foundation designs, structural, stringing, and electrical engineering; include risk assessment for terrain)

The bidder shall explain how they will confirm the route and profiles, complete survey and geotechnical investigations, finalize tower spotting and foundation selection, and address terrain / access / seasonal constraints before opening construction fronts. The point is to show practical understanding of this corridor and of the dependencies between investigations, design decisions, and starting the works. Diagrams or short step-by-step descriptions are acceptable.

2.2.2. Testing and Supply Methodologies [10%]

(Factory Acceptance/Type Tests and Supply of Equipment/Materials; Detail approach for the Factory Acceptance Tests and Type Tests (if not available beforehand), and outline for procurement, manufacturing, shipment, customs, FAT/SAT plan, and input resources from OEM's work to site; integrate timelines and quality checks)

The bidder shall describe the sequence from procurement to delivery for towers, conductors, OPGW, insulators, hardware and earthing materials, and where/when factory tests and inspections will take place (including use of existing type tests if acceptable, or execution of new type tests if necessary). The objective is to see that the bidder has a realistic, quality-controlled supply plan for long-lead items and that all items called for in the ER will actually be available for construction.

2.2.3. Execution and Commissioning Methodologies [10%]

(Civil & Electrical Installation Works, and Commissioning of Plant & Facilities; Assessing civil and electrical works, tower erection, stringing, jointing, welding, and commissioning; include sequencing and milestones)

The bidder shall explain and demonstrate how foundations, tower erection, stringing, jointing / sagging, and line commissioning will be carried out, including work in multiple sections, safety around energized crossings, and interface with existing systems. If erection / stringing subcontractors are proposed, the bidder should state scope boundaries and supervision arrangements. The aim is to confirm that the proposed method can achieve the contract scope within the time allowed.

2.2.4. Supply Chain Risk Management and Quality Assurance Plan [5%]

(Detailed risk matrix, risk probability with impact scores, Alternative qualified supplier, QA procedures, QC methodology, (Third Party) Audit, Environmental, Social, Health, and Safety integration under ESF)

The bidder shall provide contract-focused descriptions of each main or critical supply / logistics risks (single sources, transport / customs, seasonal access, cross-border issues) and the measures to mitigate them (alternative sources, earlier call-off, buffer stock, inspection points). The QA/QC part should show how inspection, testing, and documentation will be controlled from factory to site. This will confirm that the bidder is proactive and not relying only on general corporate QA text.

2.2.5. Methodology for Involvement of Local Subcontractors, Suppliers and Personnel and Women-owned Businesses (WOB) [5%]

(Use of locally sourced materials (Zambian-registered SMEs, WOB, Zambian workforce, aggregates, cement, non-specialized steel (not for tower and forced structure), capacity building program for local firms)

The bidder shall demonstrate clear participation of local subcontractors, suppliers and personnel during the entire phase of the contract as required, and outline which work packages or services will be offered to Zambian-registered SMEs, WOBs, and local labour, and which inputs can be sourced locally (aggregates, cement, basic steel, transport, camp services). The plan should be practical and consistent with the project timeline; i.e. local participation should be integrated without causing delays. This will confirm that the bidder has a concrete plan, not just a statement of intent.

3. Mobilization Schedule [5%]

(Assess realism and completeness, integration with construction critical paths)

The Bidder should submit a time-bound mobilization schedule showing establishment of camps/yards/offices, arrival and customs clearance of initial tools and equipment, mobilization of erection and stringing equipment, deployment of key supervisory and HSES staff, and the point at which construction fronts can be opened. Special pay attention will be realistic for a remote 330kV line including arrival of line plant (tensioners, pullers, gin poles, cranes), survey and foundation teams, site camps, and initial material deliveries.

This will confirm that the bidder can start the works promptly and at a sufficient scale in the first months, considering local logistics and any use of local subcontractors. The mobilization schedule should correspond to the resources described in the project management section.

4. Construction Schedule [5%]

(Covering all the details as mentioned in the Construction Schedule Form under section IV – Bidding Forms; Evaluate critical paths, milestones, and resource integration)

The Bidder should submit a construction schedule/programme covering all major stages: design finalization, procurement/deliveries, foundations, tower erection, stringing, section-wise testing, interface with the Tanzanian section, and final commissioning.

- The Bidder shall provide in detail how the works will be carried out from site mobilization, design, procurement, manufacturing, shipment, transportation, installation and commissioning.
- The Schedule shall cover all the details as mentioned in the Construction Schedule Form under section IV – Bidding Forms; Evaluate critical paths, milestones, and resource integration.
- The involvement of any subcontractors at any stage of the supply chain and works of delivery process shall be demonstrated.

- The Bidders' Proposed Programme shall demonstrate completeness, appropriate level of detail, knowledge of works and soundness of durations.
- The schedule shall indicate the sequence of construction and completion dates for the works and parts thereof.
- The Programme shall indicate key constraints & Milestones in the schedule of detailing, approval & procurement processes.
- The Programme shall clearly depict the critical paths; Critical path network showing procurement, equipment/material orders, deliveries, and site installation period as per standard procedures.
- The bidder shall provide a risk matrix covering the different stages of the project execution and measures for risk management/mitigation.

This factor will assess that the bidder's proposed schedule is coherent, time-feasible, and properly integrated (procurement, deliveries, site activities, and commissioning).

5. Environmental, Social, Health and Safety Strategy [15%]

5.1. Environmental Strategy Demonstrated by the Bidder [5%]

(Biodiversity, Waste Management, pollution, ESMP plans, fuel oil handling/containment; noise design and management for construction equipment.)

The Bidder shall outline a clear and detailed robust Environmental Strategy for each of the following:

- Biodiversity Impacts (Flora and Fauna):** Identification and management of impacts on both flora and fauna. Particular attention must be given to the highly sensitive Euphorbia habitat at Mwela Rocks, where minimized tower footprints are required. The bidder shall also carefully survey and plan the access path/road in this area to avoid any disturbance to Euphorbia. In addition, the Bidder shall address avifauna collision risks by planning for the bird flight diverters at the spans and locations identified in the ESIA/ESMP, and by explaining how these will be integrated into the line design and construction.
- Waste Management:** Identification and management of different types of waste streams.
- Pollution Prevention:** Identification and management of potential pollution impacts related to air, water, soil, and noise.
- Specific Management Plans:** Development and implementation of specific management plans as per ESMP for implementation of the environmental strategy. Specific management plans related to the implementation of the environmental strategy should be outlined and described.
- Compliance and adherence to Laws and World Bank ESF Standards:** Compliance and adherence to relevant environmental laws, regulations and World Bank ESF Standards for implementation of the environmental strategy. Relevant environmental laws,

regulations, and specific World Bank ESF standards related to implementation of the environmental strategy should be outlined and described.

- vi. **Awareness and Training:** Environmental awareness training for workers and the community. List of training topics, modes of delivery, target groups, and frequency of training shall be outlined.

Monitoring and Reporting on Environmental Management: Monitoring tools, parameters to be monitored, mode and frequency of monitoring and reporting, and plans for corrective action shall be indicated.

5.2. Social Strategy Demonstrated by the Bidder [5%]

(Stakeholder engagement, GRM, anti-GBV/SEAH prevention, Traffic, Road safety (heavy-haul movements), Dust, Sound)

The Bidder shall outline a clear and detailed robust Social Strategy for each of the following:

- i. **Stakeholder and Community Engagement:** Shall describe strategy for Stakeholder Identification and Engagement, Methods of Consultation, and Documentation of Engagement.
- ii. **Grievance Mechanism for Workers and Communities:** Shall describe strategy for Worker and Community Grievance Mechanism, including Channels for submission of grievances, Process for management of received grievances, and plan for Monitoring of grievances.
- iii. **Anti-GBV and SEAH Prevention:** Shall present a strong strategy for management of Gender-Based Violence (GBV) and Sexual Exploitation Abuse and Harassment (SEAH), including clear response protocols and referral pathways for GBV/SEAH cases. Failure to address this element adequately will result in a lower rating.
- iv. **Gender:** Shall describe strategy for gender inclusion and mainstreaming especially to strengthen the enterprise's (the bidder) women employees aiming for at least 30% and involve with women and/or women-led entrepreneurs in this project. Should also aim at including youths and people with disabilities at least 10% and 5% respectively.
- v. **Specific Management Plans:** Development and implementation of specific management plans as per ESMP and Labour Management Procedure for implementation of the Social Strategy. Specific management plans related to implementation of the Social Strategy should be outlined and described.
- vi. **Compliance and adherence to Laws and World Bank ESF Standards:** Compliance and adherence to relevant labor laws and regulations, gender laws and regulations, and World Bank ESF Standards for implementation of the Social Strategy. Relevant laws, regulations, and specific World Bank ESF standards related to implementation of the Social Strategy should be outlined and described.
- vii. **Awareness and Training:** Strategy for Social awareness training for Workers and the Community on SEAH prevention, anti-GBV and other gender and social issues. Detailed training plan shall outline training topics, modes of delivery, target groups, and frequency of training and awareness activities.

- viii. **Monitoring and Reporting on Social Management:** Monitoring tools, parameters to be monitored, mode and frequency of monitoring and reporting, and plans for corrective action shall be outlined.

5.3. Health and Safety Strategy Demonstrated by the Bidder [5%]

(Risk assessment, disease, vaccination, PPE, safety tools, hygiene, emergency response, training)

The Bidder shall outline a clear and detailed, robust Health and Safety Strategy for each of the following:

- i. **Community and Occupational Health and Safety (OHS):** Shall describe a strategy for ensuring Community and Worker Health and Safety, identify potential Health and Safety risks to the Community and Workers, and outline strategies for mitigating identified risks.
- ii. **Emergency Preparedness and Response:** Shall identify potential emergencies and outline strategies for response to identified emergencies.
- iii. **Incident Reporting and Investigation:** Shall outline the potential incidents, mode and frequency for reporting incidents, and the strategy for investigation and corrective action of incidents.
- iv. **Specific Management Plans:** Development and implementation of specific management plans as per ESMP for implementation of the Health and Safety Strategy. Specific management plans related to the implementation of the Health and Safety Strategy shall be outlined and described.
- v. **Compliance and adherence to Laws and World Bank ESF Standards:** Compliance and adherence to relevant occupational health and safety laws and regulations, and World Bank ESF Standards for implementation of the Health and Safety Strategy. Relevant laws, regulations, and specific World Bank ESF Standards related to implementation of the Health and Safety Strategy shall be outlined and described.
- vi. **Awareness and Training:** Strategy for Health and Safety awareness training for Workers and the Community. List of training topics, modes of delivery, target groups, and frequency of training shall be outlined.
- vii. **Monitoring and Reporting on Health and Safety Management:** Monitoring tools, parameters to be monitored, mode and frequency of monitoring and reporting, and plans for corrective action shall be indicated.

6. Adequacy of Resources (Equipment and Personnel) Allocation for Design and Construction Stage Activities [20%]

6.1. For Project Manager [5%]

(CVs, certifications, resource allocation plan)

6.2. For the Rest of the Personnel [10%]

(CVs, certifications, resource allocation plan)

The Bidder shall submit the proposed name and CVs for the Key Personnel in accordance with form PER-1 and PER-2. Proof of relevant qualifications will be required.

Scoring Basis for Personnel

No.	Description	Percentage (Weightage)
1	Academic and professional qualifications	30%
2	Minimum years of relevant works experience	30%
3	Experience in similar works	30%
4	Working experience in the region (Zambia and the region)	5%
5	Knowledge of English language	5%

6.3. Proposed Equipment [5%]

(Access equipment lists, tower erection cranes, gin pole, tensioners, drum winches, resource allocation plan etc., specified in Section III)

The successful implementation of the works requires the utilization of design and construction approaches that consider specific project requirements and conditions and demonstrate a clear understanding of risks and risk mitigation strategies.

The Bidder shall also provide a list of major plants & equipment available, and the list of the equipment proposed for the project in accordance with Form EQU. List to include:

- Type of Equipment (owned or hired. e.g. Tower erection cranes, gin pole, tensioners, drum winches)
- Quantity & Production rate, proposed numbers.
- Details of Owned/ Hired/ To be purchased.
- Present Location.
- Mobilization plan.
- Operations and Maintenance plan.

3 Evaluation of Financial Part

The following factors and methods will apply: ***[use one or more of the following adjustment factors consistent with ITB 36.1(f) of the BDS]:***

(a) Time Schedule

Time to complete the Plant and Installation Services from the effective date specified in Article 3 of the Contract Agreement for determining time for completion of pre-commissioning activities is: 24 Months. No credit will be given for earlier completion.

(b) Life Cycle Costs

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

(c) Functional Guarantees of the Facilities

Not applicable

4 Combined Evaluation

The Employer will evaluate and compare the Bids that have been determined to be substantially responsive.

An Evaluated Bid Score (B) will be calculated for each responsive Bid using the following formula, which permits a comprehensive assessment of the evaluated cost and the technical merits of each Bid:

$$B \equiv \frac{C_{low}}{C} * X * 100 + \frac{T}{T_{high}} * (1 - X) * 100$$

where

- C = Evaluated Bid Cost
- C_{low} = the lowest of all Evaluated Bid Costs among responsive Bids
- T = the total Technical Score awarded to the Bid
- T_{high} = the Technical Score achieved by the Bid that was scored best among all responsive Bids
- X = weight for Cost as **specified in the BDS**

The Bid with the best evaluated Bid Score (B) among responsive Bids shall be the Most Advantageous Bid provided the Bidder is qualified to perform the Contract.

5 Multiple Contracts

If permitted under ITB 37.3, will be evaluated as follows: “Not Applicable”

2. Qualification

Factor	1 Eligibility					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
	All members combined		Each Partner	At least one Partner		
1.1 Nationality	Nationality in accordance with ITB 4.4.	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 ITB 4.2	Must meet requirement	must meet requirement	Must meet requirement	N / A	Letter of Bid
1.3 Bank Ineligibility	Not having been declared ineligible by the Bank as described in 4.5.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Letter of Bid
1.4 State Owned Enterprise or Institution	Compliance with conditions of ITB 4.6	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 Borrower’s country law	Not having been excluded as a result of the Borrower’s country laws or official regulations, or by an act of compliance with UN Security Council resolution, in accordance with ITB 4.8 and Section V.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Letter of Bid

Factor	2. Historical Contract Non-Performance					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		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 five (5) 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 Bidder 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 Bid Securing Declaration or Proposal Securing Declaration pursuant to ITB 4.7 and ITB 20.9	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement	Letter of Bid
2.3 Pending Litigation	Bid’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 Bidder	Must meet requirement	N / A	Must meet requirement	N / A	Form CON – 2
2.4 Litigation History	No consistent history of court/arbitral award decisions against the Bidder ³ since 1 st June 2020.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2
2.5 Declaration: Environmental and Social (ES) past performance	Declare any contract that has been suspended or terminated and/or performance security called by an employer for reasons of breach of environmental, or social (including Sexual Exploitation, and Abuse) contractual obligations in the past five years. ⁴	Must make the declaration. Where there are Specialized Subcontractor/s, the Specialized Subcontractor/s must also make the declaration.	N/A	Each must make the declaration. Where there are Specialized Subcontractor/s, the Specialized Subcontractor/s must also make the declaration.	N/A	Form CON-3 ES Performance Declaration

¹ Nonperformance, as decided by the Employer, 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 Employers 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 Bidder have been exhausted.

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

³ The Bidder shall provide accurate information on the related Letter of Bid about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent history of awards against the Bidder or any member of a joint venture may result in failure of the Bid.

⁴ The Employer may use this information to seek further information or clarifications in carrying out its due diligence.

Factor	2. Historical Contract Non-Performance					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
2.6 Bank's SEA and/or SH Disqualification	At the time of Contract Award, not subject to disqualification by the Bank for non-compliance with SEA/ SH obligations	Must meet requirement (including each subcontractor proposed by the Bidder)	N/A	Must meet requirement (including each subcontractor proposed by the Bidder)	N/A	Letter of Bid, Form CON-4

Factor	3 Financial Situation					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
	All members combined		Each member	At least one member		
3.1 Financial Capabilities	Submission of audited balance sheets (or if not required by the law of the Bidder’s Country, other financial statements acceptable to the Employer) for the last five (05) completed fiscal years (2021 to 2025) to demonstrate the current soundness of the Bidder’s 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 the Energy sector of not less than USD 73 Million calculated as total certified payments received for contracts in progress or completed, within the last five (05) years (2021 to 2025).	Must meet requirement	Must meet requirement	Must meet at least twenty-five percent (25%) of the requirement	Must meet at least forty percent (40%) of the requirement	Form FIN –3.2
3.3 Financial Resources	The Bidder must demonstrate access to, or availability of, financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet: (i) the following cash-flow requirement: USD 17 Million and (ii) the overall cash flow requirements for this contract and its current commitments. Note: • Fund-Based Financing refers to arrangements where the bidder has direct access to liquid funds — such as cash balances, overdraft facilities, term loans, or confirmed credit lines. These represent funds that can be immediately drawn and used to meet project cash flow requirements. • Non-Fund-Based Financing refers to facilities where funds are not directly disbursed but are available through instruments that support the bidder’s financial obligations — such as bank guarantees, letters of credit, or performance bonds. These instruments reflect creditworthiness but not necessarily immediate liquidity. Real Assets and/or Real Estate cannot be under Non-Fund-Based Financing. • If the case that bidders add Real Assets and/or Real Estate, are required to submit: ○ Independent valuation reports from certified valuers confirming market value;	Must meet requirement	Must meet requirement	Must meet at least twenty-five percent (25%) of the requirement	Must meet at least forty percent (40%) of the requirement	Form FIN –3.3 (see Note) Other financial sources for cash flow requirements

Factor	3 Financial Situation					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
	○ Ownership documents to confirm the assets are unencumbered; and ○ Supporting documentation showing how the asset will be leveraged for liquidity (e.g., bank certification of its acceptability as collateral, or a line of credit secured by the asset).					

Factor	4 Experience					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
4.1 General Experience	Experience in the successful execution of overhead transmission line projects under contracts in the role of contractor, subcontractor, or management contractor for at least the last ten (10) years starting 1st January 2016.	Must meet requirement	N / A	Must meet requirement	N / A	Form EXP-4.1
4.2(a) Specific Experience	(a) Participation as contractor, joint venture member ⁵ , management contractor, or subcontractor, in at least_two (02) contracts within the last ten (10) years preceeding the bid submission deadline, each with a value of at least United States Dollars Sixty-Eight million_(USD 68 million), that have been successfully and substantially ⁶ completed and that are similar to the proposed Plant and Installation Services. The similarity of the contracts shall be based on the following: (i) Scope Similarity The contracts must be similar in nature and complexity to the Section VII - Employer’s Requirement. Similarity shall be based on the following: • Technical Scope: Design, supply, installation, and commissioning of double circuit (DC) overhead transmission lines (OHL) with a minimum 330kV. • Project Characteristics: Comparable physical size, complexity, methods / technology, and execution approach. (ii) International Experience At least one (1) of the two contracts must have been implemented outside the Bidder’s country of registration. The Bidder shall provide supporting documentation including: • Contract references and completion certificates. • Evidence of the Bidder’s role and share in the contract (especially for JV contracts). • Operational performance records confirm at least one year of successful operation.	Must meet requirement	Must meet requirements ⁷	N / A	N/A	Form EXP 4.2(a) Any format certified by the employer for one year operation.

⁵ For contracts under which the Bidder participated as a joint venture member or sub-contractor, only the Bidder's share, by value, shall be considered to meet this requirement

⁶ Substantial completion shall be based on 80% or more Plant and installation completed under the contract.

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	Bidder				
		Single Entity	Joint Venture (existing or intended)			
	All members combined		Each member	At least one member		
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: The Bidder shall demonstrate experience in successfully completing at least one (1) contract that meets the following criteria: • Scope of Work: Design, Supply and installation of a double circuit transmission (DC) line with a voltage rating of 330kV or higher. Higher voltage is advantage for the evaluation in the technical factors and sub factors. • Minimum Line Length: The DC transmission line must have a total installed length of not less than 180 kilometers. • Performance Benchmark: The contract must show that the Bidder achieved an average erection rate of at least forty (40) transmission towers per month, sustained over a continuous twelve (12) month period • Minimum Output: The total number of towers erected during any such twelve (12) month period must be at least four hundred forty (440). Supporting documentation must clearly indicate (i) the contract scope, (ii) voltage level, (iii) line length, and (iv) monthly tower erection rates to verify compliance with the above criteria.	Must meet requirements	Must meet requirements ⁸	N / A	N/A	Form EXP-4.2(b)
4.2 (c) Specific Experience in managing ES aspects as per requirements in the attached ESMP document.	The Bidder shall demonstrate relevant experience in managing Environmental and Social (E&S) risks and impacts under: • The contracts referenced in Clause 4.2(a), and/or • Any other two (2) contracts completed between 1st June 2015 and the bid submission deadline, • Where the Bidder participated as a prime contractor, joint venture member, or subcontractor. The Bidder’s experience must be clearly detailed and supported by documentation, specifically addressing the following aspects: i. Environmental Management	Must meet requirements	Must meet requirements	Must meet the following requirement: N/A	Must meet the following requirements: N/A	Form EXP – 4.2 (c)

⁸ 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	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
	- Waste Management - Pollution Prevention - Biodiversity Management (including Flora and Fauna) ii. Social Management - Stakeholder Engagement - Grievance Redress Mechanism - Gender-Based Violence (GBV), Gender Mainstreaming, Gender inclusion, Sexual Exploitation, Abuse and Harassment (SEAH), and Gender Management - Labour Management iii. Health and Safety Management - Community and Worker Occupational Health and Safety (OHS) - Emergency Preparedness - Incident Management The Bidder shall provide evidence of its role and responsibilities in each contract, including: - Scope of E&S activities undertaken, - Duration and outcomes of implementation, - Any third-party verification or client references confirming successful E&S management.					

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Letter of Bid - Technical Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

The Bidder must prepare this Letter of Bid on stationery with its letterhead clearly showing the Bidder's complete name and business address.

Note: All italicized text is to help Bidders in preparing this form.

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

RFB No.: ZM-ZESCO-495219-CW-RFB

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

We, the undersigned, hereby submit our Bid, in two parts, namely:

- (a) the Technical Part, and
- (b) the Financial Part

In submitting our Bid, we make the following declarations:

- (a) **No reservations:** We have examined and have no reservations to the bidding document, including Addenda issued in accordance with Instructions to Bidders (ITB 8);
- (b) **Eligibility:** We meet the eligibility requirements and have no conflict of interest in accordance with ITB 4;
- (c) **Bid-Securing Declaration:** We have not been suspended nor declared ineligible by the Employer based on execution of a Bid-Securing Declaration or Proposal-Securing Declaration in the Employer's country in accordance with ITB 4.7;
- (d) **Sexual Exploitation and Abuse (SEA) and/or Sexual Harassment (SH):** *[select the appropriate option from (i) to (v) below and delete the others].*

We *[where JV, insert: "including any of our JV members"]*, and any of our subcontractors:

- (i) [have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations.]
- (ii) [are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations.]
- (iii) [had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor.]
- (iv) [had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations for a period of two years. We have subsequently provided and demonstrated that we have adequate capacity and commitment to comply with SEA and SH prevention and response obligations.]

- (v) [had been subject to disqualification by the Bank for non-compliance with SEA/SH obligations for a period of two years. We have attached documents demonstrating that we have adequate capacity and commitment to comply with SEA and SH prevention and response obligations.]
- (e) **Conformity:** We offer to provide design, supply and installation services in conformity with the bidding document of the following: *[insert a brief description of the Plant, Design, Supply and Installation Services]*
-
- (f) **Bid Validity:** Our Bid shall be valid until *[insert day, month and year in accordance with ITB 19.1]*, and it shall remain binding upon us and may be accepted at any time on or before this date;
- (g) **Performance Security:** If our Bid is accepted, we commit to obtain a Performance Security in accordance with the bidding document;
- (h) **One Bid Per Bidder:** We are not submitting any other Bid(s) as an individual Bidder, and we are not participating in any other Bid(s) as a Joint Venture member, and meet the requirements of ITB 4.3, other than alternative Bids submitted in accordance with ITB 13;
- (i) **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 or a debarment imposed by the World Bank Group or a debarment imposed by the World Bank Group in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the World Bank and other development banks. Further, we are not ineligible under the Employer's country laws or official regulations or pursuant to a decision of the United Nations Security Council;
- (j) **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 ITB 4.6];
- (k) **Binding Contract:** We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;
- (l) **Not Bound to Accept:** We understand that you are not bound to accept the lowest evaluated cost Bid, the Most Advantageous Bid or any other Bid that you may receive; and
- (m) **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.

Name of the Bidder: **[insert complete name of the Bidder]*

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

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

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]*

*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

**: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid

Technical Proposal (refer to Section III for subfactors)

- Site Organization
- Method Statement
- Mobilization Schedule
- Construction Schedule
- ES Management Strategies and Implementation Plans
- Sustainable Procurement Proposal
- Risk Assessment and Proposed Management Plan
- Code of Conduct for Contractor's Personnel (ES)
- Plant
- Contractor's Equipment
- Personnel
- Proposed Subcontractors for Major Items of Plant and Installation Services
- Others

Site Organization

Method Statement

[Note to the Bidder: (i) As required in BDS 11.2 (i), also include method statement, management strategies, implementation plans and innovations, to manage cyber security risks; (ii) if there are assessed supply chain risks, the method statement must include proposed supply chain risks management plans.]

Mobilization Schedule

Construction Schedule

ES Management Strategies and Implementation Plans (ES-MSIP)

The Bidder shall submit comprehensive and concise Environmental and Social Management Strategies and Implementation Plans (ES-MSIP) as required by ITB 11.1 (j) of the Bid Data Sheet. These strategies and plans shall describe in detail the actions, materials, equipment, management processes etc. that will be implemented by the Contractor, and its subcontractors.

In developing these strategies and plans, the Bidder shall have regard to the ES provisions of the contract including those as may be more fully described in the Employer's Requirements in Section VII.

Sustainable Procurement Proposal

*[Note to Bidder: In addition to submitting the **required** ES Management Strategies and Implementation Plans, the Bidder shall provide its proposal to demonstrate how additional sustainable procurement requirements, if any, specified in Section VII- Employer's Requirements would be addressed. The Bidder shall also provide its proposal, if any, for exceeding the sustainable procurement requirements.]*

Bidders are encouraged to outline opportunities for local content (e.g., employment, materials, training) and how these enhance project sustainability, without fixed quotas.

Risk Assessment and Proposed Management Plan

The Bidder should submit a risk register identifying the hazards anticipated during the implementation of the contract.

For the key hazards ranked by impact, the risk register shall include a description of the hazard, an assessment of the potential impact on health and safety, environment, cost, program or other, and the proposed mitigation strategy for each hazard.

Refer to Section 3: Evaluation & Qualification Criteria

Code of Conduct for Contractor's Personnel (ES) Form

We are the Contractor, *[enter name of Contractor]*. We have signed a contract with *[enter name of Employer]* for *[enter description of the Facilities]*. The Plant for the Facilities will be installed at *[enter the Site]*. Our contract requires us to implement measures to address environmental and social risks, related to the Installation Services i.e. services ancillary to the supply of the Plant for the Facilities, such as inland transportation, site preparation works/ associated civil works, installation, testing, precommissioning, commissioning, operations and maintenance etc. as the case may require.

This Code of Conduct is part of our measures to deal with environmental and social risks related to

Note to the Bidder:

The minimum content of the Code of Conduct form as set out by the Employer shall not be substantially modified. However, the Bidder may add requirements as appropriate, including to take into account Contract-specific issues/risks.

The Bidder shall initial and submit the Code of Conduct form as part of its bid.

the Installation Services.

All personnel that we utilize in the execution of the Contract, including staff, labor and other employees of us and of each Subcontractor, and any other personnel assisting us in the execution of the Contract, are referred to as Contractor's Personnel.

This Code of Conduct identifies the behavior that we require from the Contractor's Personnel employed for the execution of Installation Services at the Site (or other places in the country where the Site is located).

Our workplace is an environment where unsafe, offensive, abusive or violent behavior will not be tolerated and where all persons should feel comfortable raising issues or concerns without fear of retaliation.

REQUIRED CONDUCT

Contractor's Personnel employed for the execution of Installation Services at the Site (or other places in the country where the Site is located) shall:

1. carry out his/her duties competently and diligently;
2. comply with this Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
3. maintain a safe working environment including by:
 - a. ensuring that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;

- b. wearing required personal protective equipment;
 - c. using appropriate measures relating to chemical, physical and biological substances and agents; and
 - d. following applicable emergency operating procedures.
4. report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her life or health;
 5. treat other people with respect, and not discriminate against specific groups such as women, people with disabilities, migrant workers or children;
 6. not engage in any form of sexual harassment including unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature with other Contractor's or Employer's Personnel;
 7. not engage in Sexual Exploitation, which means any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another;
 8. not engage in Sexual Abuse, which means the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;
 9. not engage in any form of sexual activity with individuals under the age of 18, except in case of pre-existing marriage;
 10. complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation and Abuse, and Sexual Harassment (SH);
 11. report violations of this Code of Conduct; and
 12. not retaliate against any person who reports violations of this Code of Conduct, whether to us or the Employer, or who makes use of the grievance mechanism for Contractor's Personnel or the project's Grievance Redress Mechanism.

RAISING CONCERNS

If any person observes behavior that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

1. Contact [*enter name of the Contractor's Social Expert with relevant experience in handling sexual exploitation, sexual abuse and sexual harassment cases, or if such person is not required under the Contract, another individual designated by the Contractor to handle these matters*] in writing at this address [] or by telephone at [] or in person at []; or
2. Call [] to reach the Contractor's hotline (*if any*) and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

CONSEQUENCES OF VIOLATING THE CODE OF CONDUCT

Any violation of this Code of Conduct by the Contractor's Personnel may result in serious consequences, up to and including termination and possible referral to legal authorities.

FOR CONTRACTOR'S PERSONNEL:

I have received a copy of this Code of Conduct written in a language that I comprehend. I understand that if I have any questions about this Code of Conduct, I can contact [*enter name of Contractor's contact person(s) with relevant experience*] requesting an explanation.

Name of Contractor's Personnel: [insert name]

Signature:

Date: (day month year): _____

Countersignature of authorized representative of the Contractor:

Signature: _____

Date: (day month year): _____

ATTACHMENT 1: Behaviors constituting SEA and behaviors constituting SH

ATTACHMENT 1 TO THE CODE OF CONDUCT FORM**BEHAVIORS CONSTITUTING SEXUAL EXPLOITATION AND ABUSE (SEA) AND BEHAVIORS CONSTITUTING SEXUAL HARASSMENT (SH)**

The following non-exhaustive list is intended to illustrate types of prohibited behaviors.

(1) Examples of sexual exploitation and abuse include, but are not limited to:

- A Contractor's Personnel tells a member of the community that he/she can get them jobs related to the work site (e.g., cooking and cleaning) in exchange for sex.
- A Contractor's Personnel that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A Contractor's Personnel rapes, or otherwise sexually assaults a member of the community.
- A Contractor's Personnel denies a person access to the Site unless he/she performs a sexual favor.
- A Contractor's Personnel tells a person applying for employment under the Contract that he/she will only hire him/her if he/she has sex with him/her.

(2) Examples of sexual harassment in a work context

- A Contractor's Personnel comment on the appearance of another Installation Services Personnel (either positive or negative) and sexual desirability.
- When a Contractor's Personnel complains about comments made by another Contractor's Personnel on his/her appearance, the other Contractor's Personnel comment that he/she is "asking for it" because of how he/she dresses.
- Unwelcome touching of a Contractor's Personnel or Employer's Personnel by another Contractor's Personnel.
- A Contractor's Personnel tells another Contractor's Personnel that he/she will get him/her a salary raise, or promotion if he/she sends him/her naked photographs of himself/herself.

Plant

The bidder shall detail the scope of design, supply and installation.

Contractor's Equipment

Form EQU

The Bidder 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 Bidder.

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 ☐ Owned ☐ Rented ☐ Leased ☐ Specially manufactured	

Omit the following information for equipment owned by the Bidder.

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

Form FUNC

N.A.

The Bidder shall copy in the left column of the table below, the identification of each functional guarantee required in the Specification and stated by the Employer 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

Personnel

Form PER -1

Contractor's Representative and other Key Personnel Schedule

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

Contractor' Representative and Key Personnel

1.	Title of position: Contractor's Representative	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
2.	Title of position: Project Manager	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
3.	Title of position: Construction Site Manager	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>

	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
4.	Title of position: Contract Manager	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
5.	Title of position: Telecommunication (OPGW installation) Engineer	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
6.	Title of position: Site Engineer - Civil and Erection Works	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
7.	Title of position: Structural Engineer	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>

	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
8.	Title of position: Geotechnical/Foundations Design Expert: Geotechnical Engineer	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
9.	Title of position: Transmission Line Design Engineer	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
10.	Title of position: Geomatic or Surveying Engineer	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
11.	Title of position: Quantity Surveyor	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>

	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
12.	Title of position: Commissioning Engineer	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
13.	Title of position: Quality Control Engineer as QC/QA Manager	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
14.	Title of position: Environmental, Health and Safety (EHS) Manager	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
15.	Title of position: Environmental Officer	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>

	Time commitment: for this position: <i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position: <i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
16.	Title of position: Health and Safety Officer (HSO)
	Name of candidate
	Duration of appointment: <i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position: <i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position: <i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
17.	Title of position: Community Liaison Officer (CLO) <i>[Where Project SEA risks are assessed to be substantial or high, key personnel shall include an expert/s with relevant experience in addressing sexual exploitation, sexual abuse and sexual harassment cases]</i>
	Name of candidate
	Duration of appointment: <i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position: <i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position: <i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
18.	Title of position: Social and Gender Officer (SGO) <i>[Where Project SEA risks are assessed to be substantial or high, key personnel shall include an expert/s with relevant experience in addressing sexual exploitation, sexual abuse and sexual harassment cases]</i>
	Name of candidate
	Duration of appointment: <i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position: <i>[insert the number of days/week/months/ that has been scheduled for this position]</i>

	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
19.	Title of position: Biodiversity Expert	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>
20.	Title of position: Archaeologist	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g., attach high level Gantt chart)]</i>

Form PER-2

Resume of Proposed Personnel

Name of Bidder

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

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. Bidders 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 Bidder when alternative Time for **Completion is invited in ITB 13.2)**

Bidders Qualification without prequalification

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

Form ELI 1.1**Bidder Information Sheet**

Date: _____

RFB No.: _____

Page _____ of _____ pages

1. Bidder's Legal Name
2. In case of JV, legal name of each member:
3. Bidder's actual or intended Country of Registration:
4. Bidder's Year of Registration:
5. Bidder's Legal Address in Country of Registration:
6. Bidder's Authorized Representative Information Name: Address: Telephone/Fax numbers: Email Address:
7. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITB 4.4 ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1 ☐ In case of state-owned enterprise or institution, in accordance with ITB 4.6, documents establishing: • Legal and financial autonomy • Operation under commercial law • Establishing that the Bidder is not under the supervision of the Employer

8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership. The successful Bidder shall provide additional information on beneficial ownership, using the Beneficial Ownership Disclosure Form.

Form ELI 1.2**Party to JV Information Sheet**

Date: _____

RFB No.: _____

Page _____ of _____ pages

1. Bidder'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 equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITB 4.4. ☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and that they are not under the supervision of the Employer, in accordance with ITB 4.6.
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership. The successful Bidder shall provide additional information on beneficial ownership for each JV member using the Beneficial Ownership Disclosure Form.

Form CON---2**Historical Contract Non-Performance**, Pending Litigation and Litigation History

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Page _____ of _____ pages

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

Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount (currency), USD Equivalent (exchange rate)
		Contract Identification: _____ Name of Employer: _____ Address of Employer: _____ Matter in dispute: _____ Party who initiated the dispute: _____ Status of dispute: _____	
		Contract Identification: _____ Name of Employer: _____ Address of Employer: _____ 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 Sub-Factor 2.4. ☐ Litigation History in accordance with Sub-Factor 2.4 as indicated below.			
Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (currency), USD Equivalent (exchange rate)

<i>[insert year]</i>	<i>[insert percentage]</i>	Contract Identification: <i>[indicate complete contract name, number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate “Employer” or “Contractor”]</i> Reason(s) for Litigation and award decision <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>

Form CON—3

Environmental and Social Performance Declaration

[The following table shall be filled in for the Bidder, each member of a Joint Venture and each Specialized Subcontractor]

Bidder's Name: *[insert full name]*
 Date: *[insert day, month, year]*
 Joint Venture Member's or Specialized Subcontractor's Name: *[insert full name]*
 RFB No. and title: *[insert RFB number and title]*
 Page *[insert page number]* of *[insert total number]* pages

Environmental and Social Performance Declaration			
in accordance with Section III, Evaluation and Qualification Criteria			
☐ No suspension or termination of contract: An employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental or Social (ES) performance since the date specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.5.			
☐ Declaration of suspension or termination of contract: The following contract(s) has/have been suspended or terminated and/or Performance Security called by an employer(s) for reasons related to Environmental or Social (ES) performance since the date specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.5. Details are described below:			
Year	Suspended or terminated portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate main reason(s) e.g., gender-based violence; sexual exploitation or sexual abuse breaches]</i>	<i>[insert amount]</i>
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>
...	...	<i>[list all applicable contracts]</i>	...

Performance Security called by an employer(s) for reasons related to ES performance		
Year	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
<i>[insert year]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for calling of performance security: <i>[indicate main reason(s) e.g., for gender-based violence; sexual exploitation, or sexual abuse breaches]</i>	<i>[insert amount]</i>

Form CON – 4

Sexual Exploitation and Abuse (SEA) and/or Sexual Harassment Performance Declaration

[The following table shall be filled in by the Bidder, each member of a Joint Venture and each subcontractor proposed by the Bidder]

Bidder's	Name:	[insert	full	name]
Date:	[insert	day,	month,	year]
Joint Venture	Member's	or	Subcontractor's	Name:
RFB No.	and	title:	[insert RFB number	full name]
			and	title]

Page [insert page number] of [insert total number] pages

SEA and/or SH Declaration

in accordance with Section III, Evaluation and Qualification Criteria

We:

- ☐ (a) have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations
- ☐ (b) are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations
- ☐ (c) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor.

[If (c) above is applicable, attach evidence of an arbitral award reversing the findings on the issues underlying the disqualification.]

Form CCC

Current Contract Commitments / Works in Progress

Bidders and each member to a JV should provide information on their current commitments on all contracts that have been awarded, or for which a letter 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	Employer, contact address/tel/fax	Value of outstanding work (current US\$ equivalent)	Estimated completion date	Average monthly invoicing over last six months (US\$/month)
1.				
2.				
3.				
4.				
5.				
etc.				

Form FIN – 3.1**Financial Situation****Historical Financial Performance**

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Page _____ of _____ pages

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

Financial information in US\$ equivalent	Historic information for previous _____ (____) years <i>(US\$ equivalent in 000s)</i>						
	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)							

Financial information in US\$ equivalent	Historic information for previous _____ () years <i>(US\$ equivalent in 000s)</i>						
	Year 1	Year 2	Year 3	Year ...	Year n	Avg.	Avg. Ratio
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 Bidder 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**

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Page _____ of _____ pages

Annual turnover data		
Year	Amount and Currency	US\$ 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 FIN – 3.3**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 contract or contracts as indicated in Section III, Evaluation and Qualification Criteria.

Source of financing	Amount (US\$ equivalent)
1.	
2.	
3.	
4.	

Form EXP 4.1**Experience****General Experience**

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Page _____ of _____ pages

Starting Month / Year	Ending Month / Year	Years*	Contract Identification	Role of Bidder
_____	_____		Contract name: Brief Description of the contract performed by the Bidder: Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the contract performed by the Bidder: Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the contract performed by the Bidder: Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the contract performed by the Bidder: Name of Employer: Address:	_____

Starting Month / Year	Ending Month / Year	Years*	Contract Identification	Role of Bidder
_____	_____		Contract name: Brief Description of the contract performed by the Bidder: Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the contract performed by the Bidder: Name of Employer: Address:	_____

*List calendar year for years with contracts with at least nine (9) months activity per year starting with the earliest year

Form EXP –4.2(a)**Specific Experience**

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Page _____ of _____ pages

Similar Contract Number: ____ of ____ required.	Information		
Contract Identification	_____		
Award date	_____		
Completion date	_____		
Role in Contract	Prime Contractor ☐	Member in Management JV ☐	Contractor ☐
			Subcontractor ☐
Total contract amount	US\$_____		
If member in a JV or subcontractor, specify participation of total contract amount	_____%		US\$_____
Employer's Name:	_____		
Address:	_____		
Telephone/fax number:	_____		
E-mail:	_____		

Form EXP –4.2(a) (cont.)

Specific Experience (cont.)

Bidder’s Legal Name: _____

Page _____ of _____ pages

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**

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Subcontractor's Legal Name: _____

Page _____ of _____ pages

	Information		
Contract Identification	_____		
Award date	_____		
Completion date	_____		
Role in Contract	Prime Contractor ☐	Management Contractor ☐	Subcontractor ☐
Total contract amount	US\$_____		
If member in a JV or subcontractor, specify participation of total contract amount	_____ %	_____	US\$_____
Employer's Name:	_____		
Address:	_____ _____ _____		
Telephone/fax number:	_____ _____		
E-mail:	_____		

Form EXP –4.2 (b)(cont.)

Specific Experience in Key Activities (cont.)

Bidder’s Legal Name: _____

Page _____ of _____ pages

JV Member Legal Name: _____

Subcontractor’s Legal Name: _____

	Information
Description of the key activities in accordance with Sub-Factor 4.2b) of Section III:	

Form EXP –4.2(c)**Specific Experience in Managing ES aspects and any additional sustainable procurement aspects**

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Subcontractor's Legal Name: _____

Page _____ of _____ pages

1. Key Requirement no 1 in accordance with 4.2 (c): ____

Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Subcontractor ☐
Total Contract Amount	US\$ _____			
Details of relevant experience				

2. Key Requirement no 2 in accordance with 4.2 (c): _____

3. Key Requirement no 3 in accordance with 4.2 (c): _____

Form of Bid Security**Form of Bid Security – Bank Guarantee**

[The bank shall fill in this Bank Guarantee Form in accordance with the instructions indicated.]

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Employer to insert its name and address]*

RFB No.: *[Employer to insert reference number for the Request for Bids]*

Alternative No.: *[Insert identification No if this is a Bid for an alternative]*

Date: *[Insert date of issue]*

BID GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _____ *[insert name of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof]* (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its Bid (hereinafter called "the Bid") for the execution of _____ under RFB No. _____

Furthermore, we understand that, according to the Beneficiary's conditions, Bids must be supported by a Bid 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 _____ (_____) 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 Bidder:

- (a) has withdrawn its Bid prior to the Bid validity expiry date set forth in the Applicant's Letter of Bid, or any extended date provided by the Applicant; or
- (b) having been notified of the acceptance of its Bid by the Beneficiary prior to the expiry date of the Bid validity or any extension thereto provided by the Applicant, (i) has failed to execute the Contract Agreement, or (ii) has failed to furnish the Performance Security, in accordance with the Instructions to Bidders ("ITB") of the Beneficiary's bidding document.

This guarantee will expire: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security issued to the Beneficiary in relation to such contract agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Bidding process; or (ii) twenty-eight days after the expiry date of the Bid validity.

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

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.

[Signature(s)]

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

Form of Bid Security – Bid Bond

BOND NO. _____

BY THIS BOND _____ as Principal (hereinafter called “the Principal”), and _____, **authorized to transact business in** _____, as Surety (hereinafter called “the Surety”), are held and firmly bound unto _____ as Obligee (hereinafter called “the Employer”) in the sum of _____⁹(_____), for the payment of which sum, well and truly to be made, we, the said Principal and Surety, bind ourselves, our successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has submitted a written Bid to the Employer dated the ____ day of _____, 20__, for the construction of _____ (hereinafter called the “Bid”).

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal:

- (a) withdraws its Bid prior to the Bid validity expiry date set forth in the Principal’s Letter of Bid, or any extended date provided by the Principal; or
- (b) having been notified of the acceptance of its Bid by the Employer prior to the expiry date of the Bid validity or any extension thereto provided by the Principal, (i) fails or refuses to execute the Contract Form, if required; or (ii) fails or refuses to furnish the Performance Security in accordance with the Instructions to Bidders;

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

The Surety hereby agrees that its obligation will remain in full force and effect up to and including the date 28 days after the date of expiry of the Bid validity set forth in the Principal’s Letter of Bid or any extension thereto provided by the Principal.

IN TESTIMONY WHEREOF, the Principal and the Surety have caused these presents to be executed in their respective names this ____ day of _____ 20__.

Principal: _____

Surety: _____

Corporate Seal (where appropriate)

(Signature)_____
(Signature)

(Printed name and title)

(Printed name and title)

⁹ The amount of the Bond shall be denominated in the currency of the *Employer’s Country* or the equivalent amount in a freely convertible currency.

Form of Bid-Securing Declaration

Date: _____

RFB No.: _____

Alternative No.: _____

To: _____

We, the undersigned, declare that:

We understand that, according to your conditions, Bids must be supported by a Bid-Securing Declaration.

We accept that we will automatically be suspended from being eligible for Bidding or submitting proposals in any contract with the Employer for the period of time specified in Section II – Bid Data Sheet, if we are in breach of our obligation(s) under the Bid conditions, because we:

- (a) have withdrawn our Bid prior to the expiry date of the Bid validity specified in the Letter of Bid or any extended date provided by us; or
- (b) having been notified of the acceptance of our Bid by the Employer prior to the expiry date of the Bid validity in the Letter of Bid or any extended date provided by us, (i) fail or refuse to execute the Contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the ITB.

We understand this Bid-Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) twenty-eight days after the expiry date of the Bid validity.

Name of the Bidder* _____

Name of the person duly authorized to sign the Bid on behalf of the Bidder** _____

Title of the person signing the Bid _____

Signature of the person named above _____

Date signed _____ day of _____, _____

*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

**: Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid

[Note: In case of a Joint Venture, the Bid-Securing Declaration must be in the name of all members to the Joint Venture that submits the Bid.]

Manufacturer's Authorization

Date: _____

RFB No.: _____

To: _____

WHEREAS

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

We _____, hereby guarantee that spare parts and technical support for the offered Goods [insert name of Goods] shall be available for purchase for a minimum period of ten (10) years from the date of Operational Acceptance.

In the event of discontinuation of production of such spare parts, we shall provide the Employer with: (a) Advance notification of at least twelve (12) months to permit the Employer to procure needed requirements; and (b) Following such discontinuation, furnishing at no cost to the Employer, the blueprints, drawings, and specifications of the spare parts, if requested.

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 _____, _____

Letter of Bid - Financial Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

The Bidder must prepare this Letter of Bid on stationery with its letterhead clearly showing the Bidder's complete name and business address.

Note: All italicized text is to help Bidders in preparing this form.

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

Request for Bid No.: *[insert identification]*

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

To: *[insert complete name of Employer]*

We, the undersigned, hereby submit the second part of our Bid, the Bid Price and Bill of Quantities. This accompanies the Letter of Bid- Technical Part.

In submitting our Bid, we make the following additional declarations:

(a) **Bid Validity:** Our Bid shall be valid until *[insert day, month and year in accordance with ITB 19.1]*, and it shall remain binding upon us and may be accepted at any time on or before this date;

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

[Option 1, in case of one lot:] Total price is: [insert the total price of the Bid 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];

(c) **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];*

(d) **Commissions, gratuities and fees:** We have paid, or will pay the following commissions, gratuities, or fees with respect to the Bidding 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.”)

Name of the Bidder: **[insert complete name of the Bidder]*

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

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

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]*

***:** In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder.

****:** Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules

Schedule of Rates and Prices

See attached forms in Excel for Price Schedules

There are separate schedules for each voltage level and a separate Grand Total Summary for the total of all voltage levels.

Schedule of Rates and Prices

Package 3: Construction of Double Circuit 400kV, 330kV, and 132kV Transmission Lines

Name of Bidder:

Signature of Bidder: _____

Schedule of Rates and Prices

Package 3: Construction of Double Circuit 400kV, 330kV, and 132kV Transmission Lines

**Part A: 132kV Nakonde - Isoka Line Loop-In/Loop-Out Double-Circuit Overhead
Transmission Line (NI)**

Name of Bidder:

Signature of Bidder: _____

132kV Nakonde - Isoka Line Loop-In/Loop-Out Double-Circuit Overhead Transmission Line (NI)							
SCHEDULE 1: Plant and Mandatory Spare Parts Supplied from Abroad							
Item	Description	Code ¹	Unit	Qty · (1)	Unit Price ²		Total Price ²
					[Specify Currency] (2)	(CIP Kasama/Nakonde) (3)	[Specify Currency] (1)x(3)
Plant, delivery of 132 kV double circuit OHTL Nakonde-Isoka							
1.00	Towers 132 kV Double Circuit OHTL Complete delivery of suspension tower 132DA (0° to 2° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
1.01	Type 132DA Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	33			0.00
1.02	Type 132DA Tower 3,0 m Body Extension (only)		each	20			0.00
1.03	Type 132DA Tower 6,0 m Body Extension (only)		each	3			0.00
1.04	Type 132DA Tower 9,0 m Body Extension (only)		each	0			0.00
1.05	Type 132DA Tower 12,0 m Body Extension (only)		each	0			0.00
1.06	Type 132DA Tower 15,0 m Body Extension (only)		each	0			0.00
1.07	Type 132DA Tower 1,0 m Leg Extension		each	33			0.00
1.08	Type 132DA Tower 2,0 m Leg Extension		each	26			0.00
1.09	Type 132DA Tower 3,0 m Leg Extension		each	13			0.00
1.10	Type 132DA Tower 4,0 m Leg Extension		each	4			0.00
1.11	Type 132DA Tower 5,0 m Leg Extension		each	4			0.00
1.12	Stubs for Type 132DA tower		each	132			0.00
	SUB-TOTAL						0.00
2.00	Complete delivery of angle/anti-cascading tension tower, 132DB (0° to 30° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
2.01	Type 132DB Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	2			0.00
2.02	Type 132DB Tower 3,0 m Body Extension (only)		each	0			0.00
2.03	Type 132DB Tower 6,0 m Body Extension (only)		each	0			0.00
2.04	Type 132DB Tower 9,0 m Body Extension (only)		each	0			0.00
2.05	Type 132DB Tower 12,0 m Body Extension (only)		each	0			0.00
2.06	Type 132DB Tower 15,0 m Body Extension (only)		each	0			0.00
2.07	Type 132DB Tower 1,0 m Leg Extension		each	2			0.00
2.08	Type 132DB Tower 2,0 m Leg Extension		each	2			0.00
2.09	Type 132DB Tower 3,0 m Leg Extension		each	1			0.00
2.10	Type 132DB Tower 4,0 m Leg Extension		each	0			0.00
2.11	Type 132DB Tower 5,0 m Leg Extension		each	0			0.00
2.12	Stubs for Type 132DB tower		each	8			0.00
	SUB-TOTAL						0.00
3.00	Complete delivery of angle tension tower 132DC (30° to 60° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						

3.01	Type 132DC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	2			0.00
3.02	Type 132DC Tower 3,0 m Body Extension (only)		each	0			0.00
3.03	Type 132DC Tower 6,0 m Body Extension (only)		each	0			0.00
3.04	Type 132DC Tower 9,0 m Body Extension (only)		each	0			0.00
3.05	Type 132DC Tower 12,0 m Body Extension (only)		each	0			0.00
3.06	Type 132DC Tower 15,0 m Body Extension (only)		each	0			0.00
3.07	Type 132DC Tower 1,0 m Leg Extension		each	2			0.00
3.08	Type 132DC Tower 2,0 m Leg Extension		each	2			0.00
3.09	Type 132DC Tower 3,0 m Leg Extension		each	1			0.00
3.10	Type 132DC Tower 4,0 m Leg Extension		each	0			0.00
3.11	Type 132DC Tower 5,0 m Leg Extension		each	0			0.00
3.12	Stubs for Type 132DC tower		each	8			0.00
	SUB-TOTAL						0.00
4.00	Complete delivery of angle tension tower 132DD (60° to 90° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
4.01	Type 132DD Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	1			0.00
4.02	Type 132DD Tower 3,0 m Body Extension (only)		each	0			0.00
4.03	Type 132DD Tower 6,0 m Body Extension (only)		each	0			0.00
4.04	Type 132DD Tower 9,0 m Body Extension (only)		each	0			0.00
4.05	Type 132DD Tower 12,0 m Body Extension (only)		each	0			0.00
4.06	Type 132DD Tower 1,0 m Leg Extension		each	1			0.00
4.07	Type 132DD Tower 2,0 m Leg Extension		each	1			0.00
4.08	Type 132DD Tower 3,0 m Leg Extension		each	0			0.00
4.09	Type 132DD Tower 4,0 m Leg Extension		each	0			0.00
4.10	Type 132DD Tower 5,0 m Leg Extension		each	0			0.00
4.11	Stubs for Type 132DD tower		each	4			0.00
	SUB-TOTAL						0.00
5.00	Complete delivery of terminal tension tower 132DET (0° to 45° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
5.01	Type 132DET Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	1			0.00
5.02	Type 132DET Tower 3,0 m Body Extension (only)		each	0			0.00
5.03	Type 132DET Tower 6,0 m Body Extension (only)		each	0			0.00
5.04	Type 132DET Tower 9,0 m Body Extension (only)		each	0			0.00
5.05	Type 132DET Tower 1,0 m Leg Extension		each	1			0.00
5.06	Type 132DET Tower 2,0 m Leg Extension		each	1			0.00
5.07	Type 132DET Tower 3,0 m Leg Extension		each	0			0.00
5.08	Type 132DET Tower 4,0 m Leg Extension		each	0			0.00
5.09	Type 132DET Tower 5,0 m Leg Extension		each	0			0.00
5.10	Stubs for Type 132DET tower		each	4			0.00
	SUB-TOTAL						0.00
6.00	Complete delivery of tension tower 132SPEC (90° + 90° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
6.01	Type 132SPEC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	1			0.00
6.02	Type 132SPEC Tower 1,0 m Leg Extension		each	1			0.00
6.03	Type 132SPEC Tower 2,0 m Leg Extension		each	1			0.00

6.04	Type 132SPEC Tower 3,0 m Leg Extension		each	0			0.00
6.05	Type 132SPEC Tower 4,0 m Leg Extension		each	0			0.00
6.06	Type 132SPEC Tower 5,0 m Leg Extension		each	0			0.00
6.07	Stubs for Type 132SPEC tower		each	4			0.00
	SUB-TOTAL						0.00
7A	Foundations 132 kV Double Circuit OHTL All Foundations Material for tower types according to the specification, all necessary reinforcement, shuttering material, complete tower earthing material and their connections to tower.						
7.00	Complete delivery of foundations material for tower type: Suspension tower 132DA (0° to 2° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
7.01	Foundation class 1		set	1			0.00
7.02	Foundation class 2		set	1			0.00
7.03	Foundation class 3		set	3			0.00
7.04	Foundation class 4		set	22			0.00
7.05	Foundation class 4W		set	3			0.00
7.06	Foundation class 5		set	1			0.00
7.07	Foundation class 5W		set	1			0.00
7.08	Foundation for soil class 6		set	1			0.00
	SUB-TOTAL						0.00
8.00	Complete delivery of foundations material for tower type: angle/anti-cascading tension tower 132DB (0° to 30° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
8.01	Foundation class 1		set	0			0.00
8.02	Foundation class 2		set	0			0.00
8.03	Foundation class 3		set	0			0.00
8.04	Foundation class 4		set	1			0.00
8.05	Foundation class 4W		set	1			0.00
8.06	Foundation class 5		set	0			0.00
8.07	Foundation class 5W		set	0			0.00
8.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
9.00	Complete delivery of foundations material for tower type: angle tension tower 132DC (30° to 60° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
9.01	Foundation class 1		set	0			0.00
9.02	Foundation class 2		set	0			0.00
9.03	Foundation class 3		set	1			0.00
9.04	Foundation class 4		set	1			0.00
9.05	Foundation class 4W		set	0			0.00
9.06	Foundation class 5		set	0			0.00
9.07	Foundation class 5W		set	0			0.00
9.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
10.0	Complete delivery of foundations material for tower type: angle tension tower 132DD (60° to 90° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
10.0 1	Foundation class 1		set	0			0.00
10.0 2	Foundation class 2		set	0			0.00
10.0 3	Foundation class 3		set	0			0.00
10.0 4	Foundation class 4		set	1			0.00

10.0 5	Foundation class 4W		set	0			0.00
10.0 6	Foundation class 5		set	0			0.00
10.0 7	Foundation class 5W		set	0			0.00
10.0 8	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
11.0 0	Complete delivery of foundations material for tower type:terminal tension tower 132DET (0° to 45° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
11.0 1	Foundation class 1		set	0			0.00
11.0 2	Foundation class 2		set	0			0.00
11.0 3	Foundation class 3		set	0			0.00
11.0 4	Foundation class 4		set	1			0.00
11.0 5	Foundation class 4W		set	0			0.00
11.0 6	Foundation class 5		set	0			0.00
11.0 7	Foundation class 5W		set	0			0.00
11.0 8	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
12.0 0	Complete delivery of foundations material for tower type:tension tower 132SPEC (90° + 90° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
12.0 1	Foundation class 1		set	0			0.00
12.0 2	Foundation class 2		set	0			0.00
12.0 3	Foundation class 3		set	0			0.00
12.0 4	Foundation class 4		set	1			0.00
12.0 5	Foundation class 4W		set	0			0.00
12.0 6	Foundation class 5		set	0			0.00
12.0 7	Foundation class 5W		set	0			0.00
12.0 8	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
13.0 0	Earthing 132 kV Double circuit OHTLSupply of material for tower groundings, galvanised steel grounding rod with 20mm diamater, 0.3mm coating thickness, 1,5m length including CCS40 copper clad steel wire strand 7 No.7 AWG, threaded couplers for earth rods, earthing rod clamps, bolted tower connector clamp, C-tap compression connectors, etc. as specified in Employers Requirements.						
13.0 1	Supply of counterpoise cable, for connection to the substation earthing grid including CCS40 copper clad steel wire strand 7 No.7 AWG, bolted tower connector clamp, C-tap compression connectors as specified in Employers Requirements		km	1.5			0.00
13.0 2	Supply of material for Earthing Type A, as specified in Employers Requirements.		each	40			0.00
13.0 3	Supply of material for Earthing enhancements Type B, as specified in Employers Requirements.		each	28			0.00
13.0 4	Supply of material for Earthing enhancements Type C, as specified in Employers Requirements.		each	8			0.00

13.0 5	Supply of material for Earthing enhancements for Type D where required as per specification to achieve specified tower footing resistance		each	4			0.00
	SUB-TOTAL						0.00
14.0 0	Insulator and Fittings 132 kV Double circuit OHTL LINE CONDUCTOR INSULATORS AND FITTINGS Supply of Complete Insulator Sets including insulators, all types of clamps, armour rods, extension links, pilot insulator sets, counterweights and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Schedule of Guarantee Characteristics						
14.0 1	Single Suspension insulator set for single "Wolf" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends		set	174			0.00
14.0 2	Double Suspension insulator set for single "Wolf" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends.		set	24			0.00
14.0 3	Double Tension insulator set for single "Wolf" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends		set	72			0.00
14.0 4	Counter weights for reduction of insulator swing		set	12			0.00
	SUB-TOTAL						0.00
15.0 0	CONDUCTOR , OPGW AND GROUND WIRES Supply, stringing and installation including all joints, sleeves, jumper loops, spacers and necessary dampers, earthing connections and all downleads as per Employers Requirements. All cost for Employer's inspector during test shall be covered as per Employers RequirementsLine route is 13km						
15.0 1	ACSR Conductor Code Name "Wolf"; 6 phases, stringing of double circuit		route km	13			0.00
15.0 2	Optical Ground Wire (OPGW) type ACS 7/6 AWG, 48 cores. ITU-T G.652D s/c rating 200 kA²/sec , including all splicing and connections to joint boxes.		route km	13			0.00
15.0 3	ADSS 48 cores ITU-T G.652D (Option)		route km	2.5			0.00
15.0 4	Joint Box 48 cores ADSS/OPGW		each	2			0.00
15.0 5	Wooden poles 12 m for complete ADSS-line, including foundations, pole earthing , stayes and fittings		each	25			0.00
15.0 6	Stockbridge type vibration dampers for "Wolf" conductor		each	1080			0.00
15.0 7	Stockbridge type vibration dampers for OPGW		each	150			0.00
15.0 8	Mid - span tension joint for "Wolf" conductor		each	80			0.00
15.0 9	Repair sleeve for "Wolf" conductor		each	8			0.00
	SUB-TOTAL						0.00
15.1 0	Fall Arrest System		set	5			0.00
	SUB-TOTAL						0.00
16.0 0	OPGW FITTINGS AND ACCESSORIES Supply and installation of complete Sets of Fittings, including all types of clamps, extension links, armor rods, counterweights, earth bonds and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Employers Requirement section VII Part II.						
16.0 1	Suspension set for OPGW		each	33			0.00
16.0 2	Straight through double tension set for OPGW		each	13			0.00
16.0 3	Double dead end tension set, including down the tower connection to joint box on suspension or tension tower for OPGW		each	6			0.00
16.0 4	Tension terminal dead end down set for OPGW		each	2			0.00
16.0 5	Joining Box for OPGW/OPGW, for use within the transmission line, including fixing, splicing and downlead clamps, with feed through sets, suitable for up to 48 cores, ITU 652D. s/c rating 200 kA²/sec and OPGW, types as per specification		each	3			0.00

16.0 6	4 way Jointing Box for OPGW/OPGW/OFC, for use within the transmission line, including fixing, splicing and downlead clamps, with feed through sets, suitable for up to 48 cores. ITU 652D s/c rating 200 kA²/sec and OPGW, types as per specification		each	2			0.00
16.0 7	Terminal Box for OPGW/OFC, for the connection at substation gantry, including fixing, splicing and downlead clamps, for 48 cores ITU G-652D, s/c rating 200 kA²/sec and OPGW/OFC, types as per specification		each	2			0.00
	SUB-TOTAL						0.00
17.0 0	Tools and Equipment						
17.0 1	Conductor "stockings" for pulling conductor to fit ACSR "Wolf"		each	6			0.00
17.0 2	Pre-formed armoured type Repair Sleeves for ACSR "Wolf"		each	60			0.00
17.0 3	Compression type repair sleeves for ACSR "Wolf"		each	60			0.00
17.0 4	Tandem come along clamp (Riganti or Klein) for ACSR "Wolf" conductor		each	12			0.00
	SUB-TOTAL						0.00
18.0 0	SPARES						
18.0 1	CONDUCTOR AND OPGW						
18.0 2	Spare ACSR "Wolf" Conductor		km	10			0.00
18.0 3	Spare OPGW type ACS 7/6 AWG		km	5			0.00
18.0 4	Counterpoise cable		km	1			0.00
18.0 5	LINE CONDUCTOR INSULATORS AND FITTINGS						
18.0 6	Composite insulator set complete with all fittings for ACSR "Wolf"		each	120			0.00
18.0 7	OVERHEAD LINE ACCESSORIES						
18.0 8	Assortment of tower bolts		tonne	1			0.00
18.0 9	Assortment of anti-theft type tower bolts		tonne	1			0.00
18.1 0	Vibration Dampers for ACSR "Wolf"		each	10			0.00
18.1 1	Tension Clamps for ACSR "Wolf"		each	60			0.00
18.1 2	Suspension clamps for ACSR "Wolf"		each	120			0.00
	SUB-TOTAL						0.00
	TOTAL (To Schedule No. 5, Grand Summary)						0.00
	Name of Bidder:						
	Signature of Bidder:						
19.0 0	OPTION to be Priced, Ref: SCHEDULE 3, item: 5,00						
19.0 1	Supply of OPGW 48 cores ITU-T G.652D 2.5 km on existing 66 kV towers		route km	2.5			0.00
19.0 2	Supply of material for modification of peak of existing 66 kV towers to fit 2 OPGW		route km	2.5			0.00
19.0 3	Supply of Joint Box 48 cores OPGW		each	1			0.00
	SUB-TOTAL						0.00

Name of Bidder _____

Signature of
Bidder _____

¹Bidders shall enter a code representing the country of origin of all imported plant and equipment.

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

Country of Origin Declaration Form

Item	Description	Code	Country

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132kV Nakonde - Isoka Line Loop-In/Loop-Out Double-Circuit Overhead Transmission Line (NI)						
SCHEDULE 2: Plant and Mandatory Spare Parts Supplied from within the Employer's Country						
Item	Description	Unit	Qty. (1)	Unit Price ² (EXW-Zambia) (2)	Sales and other taxes payable per line item if Contract is awarded (in accordance with ITB 17.5 (b) (ii) (3)	EXW Total Price ² (1)x(2)
				(ZMW)	(ZMW)	(ZMW)
Plant and Mandatory Spare Parts of 132 kV Nakonde-Isoka OHTL Supplied from within the Employer's Country						
1A	Foundations 132 kV Double Circuit OHTL Locally Supply of Foundation material for steel tower types according to the specification, and according to drawings and regulations of the Employer. All foundation must have a chimney height above ground of minimum 500mm.					
1.00	Local delivery of foundations material for tower type: Suspension tower 132DA (0° to 2° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
1.01	Foundation class 1	set	1			0.00
1.02	Foundation class 2	set	1			0.00
1.03	Foundation class 3	set	3			0.00
1.04	Foundation class 4	set	22			0.00
1.05	Foundation class 4W	set	3			0.00
1.06	Foundation class 5	set	1			0.00
1.07	Foundation class 5W	set	1			0.00
1.08	Foundation for soil class 6	set	1			0.00
	SUB-TOTAL				0.00	0.00
2.00	Local delivery of foundations material for tower type: angle/anti-cascading tension tower 132DB (0° to 30° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
2.01	Foundation class 1	set	0			0.00
2.02	Foundation class 2	set	0			0.00
2.03	Foundation class 3	set	0			0.00
2.04	Foundation class 4	set	1			0.00
2.05	Foundation class 4W	set	1			0.00
2.06	Foundation class 5	set	0			0.00
2.07	Foundation class 5W	set	0			0.00
2.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
3.00	Local delivery of foundations material for tower type:angle tension tower 132DC (30° to 60° angle)Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
3.01	Foundation class 1	set	0			0.00
3.02	Foundation class 2	set	0			0.00
3.03	Foundation class 3	set	1			0.00
3.04	Foundation class 4	set	1			0.00
3.05	Foundation class 4W	set	0			0.00
3.06	Foundation class 5	set	0			0.00
3.07	Foundation class 5W	set	0			0.00
3.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00

4.00	Local delivery of foundations material for tower type: angle tension tower 132DD (60° to 90° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
4.01	Foundation class 1	set	0			0.00
4.02	Foundation class 2	set	0			0.00
4.03	Foundation class 3	set	0			0.00
4.04	Foundation class 4	set	1			0.00
4.05	Foundation class 4W	set	0			0.00
4.06	Foundation class 5	set	0			0.00
4.07	Foundation class 5W	set	0			0.00
4.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
5.00	Local delivery of foundations material for tower type: terminal tension tower 132DET (0° to 45° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
5.01	Foundation class 1	set	0			0.00
5.02	Foundation class 2	set	0			0.00
5.03	Foundation class 3	set	0			0.00
5.04	Foundation class 4	set	1			0.00
5.05	Foundation class 4W	set	0			0.00
5.06	Foundation class 5	set	0			0.00
5.07	Foundation class 5W	set	0			0.00
5.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
6.00	Local delivery of foundations material for tower type:tension tower 132SPEC (90° + 90° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
6.01	Foundation class 1	set	0			0.00
6.02	Foundation class 2	set	0			0.00
6.03	Foundation class 3	set	0			0.00
6.04	Foundation class 4	set	1			0.00
6.05	Foundation class 4W	set	0			0.00
6.06	Foundation class 5	set	0			0.00
6.07	Foundation class 5W	set	0			0.00
6.08	Foundation class 6	set	0			0.00
	SUBTOTAL				0.00	0.00
7.00						
7.01						0.00
7.02						0.00
7.03						0.00
7.04						0.00
7.05						0.00
7.06						0.00
7.07						0.00
7.08						0.00
7.09						0.00
7.10						0.00
					0.00	0.00
8.00						
8.01						0.00
8.02						0.00
8.03						0.00
8.04						0.00
8.05						0.00
8.06						0.00
8.07						0.00
8.08						0.00
8.09						0.00
8.10						0.00
					0.00	0.00
9.00						

9.01						0.00
9.02						0.00
9.03						0.00
9.04						0.00
9.05						0.00
9.06						0.00
9.07						0.00
9.08						0.00
9.09						0.00
9.10						0.00
					0.00	0.00
TOTAL (To Schedule No. 5, Grand Summary)					0.00	0.00
	Name of Bidder: Signature of Bidder:					

² Specify currency in accordance with specifications in Bid Data Sheet under ITB 18.1.

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132kV Nakonde - Isoka Line Loop-In/Loop-Out Double-Circuit Overhead Transmission Line (NI)							
SCHEDULE 3: Design Services							
Item	Description	Unit	Qty. (1)	Unit Price ²		Total Price ²	
						Local Portion	Foreign Portion
				Local Currency Portion	Foreign Currency Portion	[Specify Currency]	[Specify Currency]
1.00	Survey activities like tower spotting, survey of crossing objects including pegging of towers, diagonal profiles and all necessary documentation for the OHTL, soil investigations and route clearing & access roads.			1)	2)	3)	(1)x(2) (1)x(3)
1.10	Survey, final alignment, tower plotting, preparation of plan, and profile drawings and tower schedule.	route km	15				0.00 0.00
1.20	Sub-soil investigation at support locations by means of in situ DCPT (Dynamic Cone Penetrometer Test), vane test or bearing test as defined in the scope of works	tower	40				0.00 0.00
1.30	Sub-soil investigation at support locations by means of machine boring, including all necessary drilling, sampling, soil penetration test (SPT), establishment of ground water level, laboratory testing and determination of soil/water aggressiveness	tower	40				0.00 0.00
1.40	Clearing the right-of-way & construction of all required access and maintenance roads including Installation of wayleave demarcation reinforced cement concrete markers .	Lot	1				0.00 0.00
2.00	Foundation Design (All types)	Lot	1				0.00 0.00
3.00	Tower Design (All types)	Lot	1				0.00 0.00
4.00	Insulator Design (All types)	Lot	1				0.00 0.00
5.00	Assessment of existing 66kV towers along a 2.5 route km stretch to determine loading capacity for additional 48-core OPGW (from loop-in/loop-out to the existing OPGW dome joint) as described in Employer's Requirements	Lot	1				0.00 0.00
6.00	Geotechnical Survey, Analysis and reporting	Lot	1				0.00 0.00
7.00	Foundation Design type test to ultimate or destructive for all foundations other than pad and chimney, including mobilization and erection of all test equipment and installation of the standard footing (the number of test specimen shall be the greater of (i) 1% of the total number of foundations and (ii) two (2)).	Lot	1				0.00 0.00
	SUB-TOTAL						0.00 0.00
TOTAL (To Schedule No. 5, Grand Summary)							0.00 0.00
Name of Bidder:							
Signature of Bidder:							

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132kV Nakonde - Isoka Line Loop-In/Loop-Out Double-Circuit Overhead Transmission Line (NI)							
SCHEDULE 4: Installation Services (Erection, Testing and Commissioning)							
Item No	Description	Unit	Qty.	Unit Price ²		Total Price ²	
						Local Portion	Foreign Portion
				Local Currency Portion	Foreign Currency Portion	[Specify Currency]	[Specify Currency]
0.00	Preliminaries 132kV Nakonde - Isoka Line Loop-In/Loop-Out Double-Circuit OHTL (NI)		1)	2)	3)	(1)x(2)	(1)x(3)
	Site Mobilization						
0.01	Mobilization, Store Yards, contractor personal, Site Office for contractor at localized area. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.02	Mobilization of construction equipment as per evaluation and qualification criteria. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.03A	Construction of access roads complete with the finger access roads from public roads as per Employer's Requirements	Lot	1			0.00	0.00
0.03B	Bush clearing as per Employer's Requirements	Lot	1			0.00	0.00
0.04	Insurance. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.05	Site demobilization. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.06	Water and Builder's supply. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.07	Appropriate slope or tower footing protection against erosion for one-third of the total towers	Lot	1			0.00	0.00
0.071	Grassing	Lot	1			0.00	0.00
0.072	Stone pitching	Lot	1			0.00	0.00
0.073	Rip-rap	Lot	1			0.00	0.00
0.074	Gabions	Lot	1			0.00	0.00
0.075	Terracing/cribbing	Lot	1			0.00	0.00
0.08	Installation of reinforced concrete markers along the ROW	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
	Installation and other services 132kV Nakonde - Isoka Line Loop-In/Loop-Out Double-Circuit OHTL (NI)						
1A	Installation of all Foundations 132kV Double Circuit OHTL Installation of all foundations for tower types according to the specification, including all transport, excavation, installation of stubs, all necessary reinforcement, shuttering, concreting, backfilling, compacting, erosion protection, complete tower earthing and their connections to tower, measuring of earth resistance and submitting of records to Employer/Engineer, according to drawings and regulations of the Employer. Soil class definition concerning permissible soil pressure is according to Employer's design and specifications. All foundation must have a chimney height above ground of minimum 500mm.						
1.00	Complete installation of foundations for tower type: Suspension tower 132DA (0° to 2° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
1.01	Foundation class 1	set	1			0.00	0.00
1.02	Foundation class 2	set	1			0.00	0.00
1.03	Foundation class 3	set	3			0.00	0.00

1.04	Foundation class 4	set	22			0.00	0.00
1.05	Foundation class 4W	set	3			0.00	0.00
1.06	Foundation class 5	set	1			0.00	0.00
1.07	Foundation class 5W	set	1			0.00	0.00
1.08	Foundation for soil class 6	set	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
2.00	Complete installation of foundations for tower type: Angle/anti-cascading tension tower 132DB (0° to 30° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
2.01	Foundation class 1	set	0			0.00	0.00
2.02	Foundation class 2	set	0			0.00	0.00
2.03	Foundation class 3	set	0			0.00	0.00
2.04	Foundation class 4	set	1			0.00	0.00
2.05	Foundation class 4W	set	1			0.00	0.00
2.06	Foundation class 5	set	0			0.00	0.00
2.07	Foundation class 5W	set	0			0.00	0.00
2.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
3.00	Complete installation of foundations for tower type: angle tension tower 132DC (30° to 60° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
3.01	Foundation class 1	set	0			0.00	0.00
3.02	Foundation class 2	set	0			0.00	0.00
3.03	Foundation class 3	set	1			0.00	0.00
3.04	Foundation class 4	set	1			0.00	0.00
3.05	Foundation class 4W	set	0			0.00	0.00
3.06	Foundation class 5	set	0			0.00	0.00
3.07	Foundation class 5W	set	0			0.00	0.00
3.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
4.00	Complete installation of foundations for tower type: angle tension tower 132DD (60° to 90° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
4.01	Foundation class 1	set	0			0.00	0.00
4.02	Foundation class 2	set	0			0.00	0.00
4.03	Foundation class 3	set	0			0.00	0.00
4.04	Foundation class 4	set	1			0.00	0.00
4.05	Foundation class 4W	set	0			0.00	0.00
4.06	Foundation class 5	set	0			0.00	0.00
4.07	Foundation class 5W	set	0			0.00	0.00
4.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
5.00	Complete installation of foundations for tower type: terminal tension tower 132DET (0° to 45° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
5.01	Foundation class 1	set	0			0.00	0.00
5.02	Foundation class 2	set	0			0.00	0.00
5.03	Foundation class 3	set	0			0.00	0.00
5.04	Foundation class 4	set	1			0.00	0.00
5.05	Foundation class 4W	set	0			0.00	0.00
5.06	Foundation class 5	set	0			0.00	0.00

5.07	Foundation class 5W	set	0			0.00	0.00
5.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
6.00	Complete installation of foundations for tower type: special tower 132SPEC (90° + 90°) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
6.01	Foundation class 1	set	0			0.00	0.00
6.02	Foundation class 2	set	0			0.00	0.00
6.03	Foundation class 3	set	0			0.00	0.00
6.04	Foundation class 4	set	1			0.00	0.00
6.05	Foundation class 4W	set	0			0.00	0.00
6.06	Foundation class 5	set	0			0.00	0.00
6.07	Foundation class 5W	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
7.00	TOWER LOAD TESTS AND FAT Tower Factory Acceptance Test (FAT)and Type test to ultimate loading including, supply, erection and dismantling. The test shall include a minimum of 6 (six) combination of loading cases, the testing station shall be accredited internatinally to be used for tower test and all cost for Employer's inspector during test shall be as per Employer's Requirements.						
7.01	Tower type 132DA	Lot	1			0.00	0.00
7.02	Tower type 132DB	Lot	1			0.00	0.00
7.03	Tower type 132DC	Lot	1			0.00	0.00
7.04	Tower type 132DD	Lot	1			0.00	0.00
7.05	Tower type 132DET	Lot	1			0.00	0.00
7.06	Tower type 132SPEC	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
8.00	Towers 132 kV Double Circuit OHTL Complete installation of suspension tower 132DA (0° to 2° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
8.01	Type 132DA Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	33			0.00	0.00
8.02	Type 132DA Tower 3,0 m Body Extension (only)	each	20			0.00	0.00
8.03	Type 132DA Tower 6,0 m Body Extension (only)	each	3			0.00	0.00
8.04	Type 132DA Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
8.05	Type 132DA Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
8.06	Type 132DA Tower 15,0 m Body Extension (only)	each	0			0.00	0.00
8.07	Type 132DA Tower 1,0 m Leg Extension	each	33			0.00	0.00
8.08	Type 132DA Tower 2,0 m Leg Extension	each	26			0.00	0.00
8.09	Type 132DA Tower 3,0 m Leg Extension	each	13			0.00	0.00
8.10	Type 132DA Tower 4,0 m Leg Extension	each	4			0.00	0.00
8.11	Type 132DA Tower 5,0 m Leg Extension	each	4			0.00	0.00
8.12	Stubs for Type 132DA tower	each	132			0.00	0.00
	SUB-TOTAL					0.00	0.00
9.00	Complete installation of angle/anti-cascading tension tower, 132DB (0° to 30° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						

9.01	Type 132DB Tower Basic body and crossarms $\pm$ 0 m body extension + 0 m leg extensions	per tower	2			0.00	0.00
9.02	Type 132DB Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
9.03	Type 132DB Tower 6,0 m Body Extension (only)	each	0			0.00	0.00
9.04	Type 132DB Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
9.05	Type 132DB Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
9.06	Type 132DB Tower 15,0 m Body Extension (only)	each	0			0.00	0.00
9.07	Type 132DB Tower 1,0 m Leg Extension	each	2			0.00	0.00
9.08	Type 132DB Tower 2,0 m Leg Extension	each	2			0.00	0.00
9.09	Type 132DB Tower 3,0 m Leg Extension	each	1			0.00	0.00
9.10	Type 132DB Tower 4,0 m Leg Extension	each	0			0.00	0.00
9.11	Type 132DB Tower 5,0 m Leg Extension	each	0			0.00	0.00
9.12	Stubs for Type 132DB tower	each	8			0.00	0.00
	SUB-TOTAL					0.00	0.00
10.00	Complete installation of angle tension tower 132DC (30° to 60° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
10.01	Type 132DC Tower Basic body and crossarms $\pm$ 0 m body extension + 0 m leg extensions	per tower	2			0.00	0.00
10.02	Type 132DC Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
10.03	Type 132DC Tower 6,0 m Body Extension (only)	each	0			0.00	0.00
10.04	Type 132DC Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
10.05	Type 132DC Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
10.06	Type 132DC Tower 15,0 m Body Extension (only)	each	0			0.00	0.00
10.07	Type 132DC Tower 1,0 m Leg Extension	each	2			0.00	0.00
10.08	Type 132DC Tower 2,0 m Leg Extension	each	2			0.00	0.00
10.09	Type 132DC Tower 3,0 m Leg Extension	each	1			0.00	0.00
10.10	Type 132DC Tower 4,0 m Leg Extension	each	0			0.00	0.00
10.11	Type 132DC Tower 5,0 m Leg Extension	each	0			0.00	0.00
10.12	Stubs for Type 132DC tower	each	8			0.00	0.00
	SUB-TOTAL					0.00	0.00
11.00	Complete installation of angle tension tower 132DD (60° to 90° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
11.01	Type 132DD Tower Basic body and crossarms $\pm$ 0 m body extension + 0 m leg extensions	per tower	1			0.00	0.00
11.02	Type 132DD Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
11.03	Type 132DD Tower 6,0 m Body Extension (only)	each	0			0.00	0.00
11.04	Type 132DD Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
11.05	Type 132DD Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
11.06	Type 132DD Tower 1,0 m Leg Extension	each	1			0.00	0.00
11.07	Type 132DD Tower 2,0 m Leg Extension	each	1			0.00	0.00
11.08	Type 132DD Tower 3,0 m Leg Extension	each	0			0.00	0.00
11.09	Type 132DD Tower 4,0 m Leg Extension	each	0			0.00	0.00
11.10	Type 132DD Tower 5,0 m Leg Extension	each	0			0.00	0.00
11.11	Stubs for Type 132DD tower	each	4			0.00	0.00
	SUB-TOTAL					0.00	0.00

12.00	Complete installation of terminal tension tower 132DET (0° to 45° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
12.01	Type 132DET Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	1			0.00	0.00
12.02	Type 132DET Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
12.03	Type 132DET Tower 6,0 m Body Extension (only)	each	0			0.00	0.00
12.04	Type 132DET Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
12.05	Type 132DET Tower 1,0 m Leg Extension	each	1			0.00	0.00
12.06	Type 132DET Tower 2,0 m Leg Extension	each	1			0.00	0.00
12.07	Type 132DET Tower 3,0 m Leg Extension	each	0			0.00	0.00
12.08	Type 132DET Tower 4,0 m Leg Extension	each	0			0.00	0.00
12.09	Type 132DET Tower 5,0 m Leg Extension	each	0			0.00	0.00
12.10	Stubs for Type 132DET tower	each	4			0.00	0.00
	SUB-TOTAL					0.00	0.00
13.00	Complete installation of tension tower 132SPEC (90° + 90° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
13.01	Type 132SPEC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	1			0.00	0.00
13.02	Type 132SPEC Tower 1,0 m Leg Extension	each	1			0.00	0.00
13.03	Type 132SPEC Tower 2,0 m Leg Extension	each	1			0.00	0.00
13.04	Type 132SPEC Tower 3,0 m Leg Extension	each	0			0.00	0.00
13.05	Type 132SPEC Tower 4,0 m Leg Extension	each	0			0.00	0.00
13.06	Type 132SPEC Tower 5,0 m Leg Extension	each	0			0.00	0.00
13.07	Stubs for Type 132SPEC tower	each	4			0.00	0.00
	SUB-TOTAL					0.00	0.00
14.00	Earthing 132 kV Double circuit OHTL Installation Works - tower groundings including excavation, laying of counterpoise, connection to towers including all clamps and other connections, corrosion protection, backfilling, compaction and measuring of ohmic value. The protection against corrosion of chemical attack to the earthing systems shall be taken into consideration as specified Employer Requirements Sections VII.						
14.01	Installation of Supply of counterpoise cable, for connection to the substation earthing grid including CCS40 copper clad steel wire strand 7 No.7 AWG, bolted tower connector clamp, C-tap compression connectors as specified in Employers Requirements	km	1.5			0.00	0.00
14.02	Installation of Supply of material for Earthing Type A, as specified in Employers Requirements.	each	40			0.00	0.00
14.03	Installation of Supply of material for Earthing enhancements Type B, as specified in Employers Requirements.	each	28			0.00	0.00
14.04	Installation of Supply of material for Earthing enhancements Type C, as specified in Employers Requirements.	each	8			0.00	0.00
14.05	Installation of Supply of material for Earthing enhancements for Type D where required as per specification to achieve specified tower footing resistance	each	4			0.00	0.00
	SUB-TOTAL					0.00	0.00

15.00	Insulator and Fittings 132kV Double circuit OHTL INSTALLATION OF LINE CONDUCTOR INSULATORS AND FITTINGS Installation of Complete Insulator Sets including insulators, all types of clamps, armour rods, extension links, pilot insulator sets, counterweights and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Schedule of Guarantee Characteristics						
15.01	Single Suspension insulator set for single "Wolf" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends	set	174			0.00	0.00
15.02	Double Suspension insulator set for single "Wolf" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends.	set	24			0.00	0.00
15.03	Double Tension insulator set for single "Wolf" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends	set	72			0.00	0.00
15.04	Counter weights for reduction of insulator swing	set	12			0.00	0.00
15.05	Factory acceptance tests (FAT) for Insulators as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
15.06	Factory acceptance tests (FAT) Fittings and Accessories for Insulator as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
15.07	Test for arcing horn as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
15.08	Type Test for Insulator Strings as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
15.10	Fall Arrest System	set	5			0.00	0.00
	SUB-TOTAL					0.00	0.00
16.00	CONDUCTOR AND OPGW Stringing and installation including all joints, sleeves, jumper loops, spacers and necessary dampers, earthing connections and all downleads as per Employers Requirements. All cost for Employer's inspector during test shall be covered as per Employers Requirements						
16.01	Installation of ACSR Conductor Code Name "Wolf"; 6 phases, stringing of double circuit	route km	13			0.00	0.00
16.02	Installation of Optical Ground Wire (OPGW) type ACS 7/6 AWG, 48 cores. ITU-T G.652D s/c rating 200 kA2/sec , including all splicing and connections to joint boxes.	route km	13			0.00	0.00
16.03	Installation of Wooden poles 12 m for complete ADSS-line, including foundations, pole earthing , stayes and fittings, 100m span length	route km	2.5				
16.04	Installation of ADSS 48 cores ITU-T G.652D on 12m wooden poles	route km	2.5			0.00	0.00
16.05	Installation of Stockbridge type vibration dampers for "Wolf" conductor	each	1080			0.00	0.00
16.06	Installation of Stockbridge type vibration dampers for OPGW	each	150			0.00	0.00
16.07	Installation of Mid - span tension joint for "Wolf" conductor	each	80			0.00	0.00
16.08	Installation of Repair sleeve for "Wolf" conductor	each	8			0.00	0.00
16.09	Type test, Conductors as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
16.10	Type test, OPGW as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
16.11	Factory acceptance tests (FAT), "Wolf" Conductor test as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
16.12	Factory acceptance tests (FAT), ADSS 48 cores ITU-T G.652D test as per Employer Requirement; Section VII, Part II	Lot	1				
16.13	Factory acceptance tests (FAT), for vibration damper as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
16.14	Factory acceptance tests (FAT), on suspension clamp for Wolf conductor as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
16.15	Factory acceptance tests (FAT), on tension clamp for Wolf conductor as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00

17.00	OPGW FITTINGS AND ACCESSORIES Installation of complete Sets of Fittings, including all types of clamps, extension links, armor rods, counterweights, earth bonds and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Employers Requirement section VII Part II.						
17.01	Installation of Suspension set for OPGW	each	33			0.00	0.00
17.02	Installation of Straight through double tension set for OPGW	each	13			0.00	0.00
17.03	Installation of Double dead end tension set, including down the tower connection to joint box on suspension or tension tower for OPGW	each	6			0.00	0.00
17.04	Installation of Tension terminal dead end down set for OPGW	each	2			0.00	0.00
17.05	Installation of Jointing Box for OPGW/OPGW, for use within the transmission line, including fixing, splicing and downlead clamps, with feed through sets, suitable for up to 48 cores, ITU 652D. s/c rating 200 kA2/sec and OPGW, types as per specification	each	3			0.00	0.00
17.06	Installation of 4 way Jointing Box for OPGW/OPGW/OFC, for use within the transmission line, including fixing, splicing and downlead clamps, with feed through sets, suitable for up to 48 cores. ITU 652D s/c rating 200 kA2/sec and OPGW, types as per specification	each	2			0.00	0.00
17.07	Installation of Terminal Box for OPGW/OFC, for the connection at substation gantry, including fixing, splicing and downlead clamps, for 48 cores ITU G-652D, s/c rating 200 kA2/sec and OPGW/OFC, types as per specification	each	2			0.00	0.00
17.08	Factory acceptance tests (FAT),Test on joint boxes and splices for Optical Fibre as per TS-1	Lot	1			0.00	0.00
17.09	FAT, Fittings & Accessories for OPGW	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
18.00	Site Offices						
18.01	Site offices for the Engineer / Employer's staff at site, fully furnished as described in Section VII of the Bidding Documents - Employer Requirements section VII part II. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
18.02	Office equipment as per Table 3 in the Bidding Documents - Employer's Requirements section VII part II. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
19.00	As built documentation						
19.01	All necessary as built documentation including drawings, data sheets, maps maintenance instructions, spare part list etc.	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
20.00	Testing and commissioning						
20.01	Testing, final inspection, Energizing and commissioning	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
TOTAL (To Schedule No. 5, Grand Summary)						0.00	0.00
	Name of Bidder:						
	Signature of Bidder:						
21.00	OPTION to be Priced, Ref: SCHEDULE 3, item: 5,00						
21.01	Installation of OPGW 48 cores ITU-T G.652D 2.5 km on existing 66 kV towers	route km	2.5			0.00	0.00
21.02	Installation of material for modification of peak of existing 66 kV towers to fit 2 OPGW	route km	2.5			0.00	0.00
21.03	Installation of Joint Box 48 cores OPGW	each	1			0.00	0.00
	SUB-TOTAL					0.00	0.00

² Specify currency in accordance with ITB 18.

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132kV Nakonde - Isoka Line Loop-In - Loop-Out Double-Circuit Overhead Transmission Line (NI)			
SCHEDULE: No. 5 Grand Summary			
Item	Description	Total Price ¹	
		Foreign [Specify Currency]	Local (ZMW)
¹ Specify currency in accordance with requirements stipulated in Bid Data Sheet under ITB 18.1 & 18.2.			
	Total Schedule No. 1. Plant, and Mandatory Spare Parts Supplied from Abroad	0.00	0.00
	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country	0.00	0.00
	Total Schedule No. 3. Design Services	0.00	0.00
	Total Schedule No. 4. Installation and Other Services	0.00	0.00
	Total	0.00	0.00
		Name of Bidder _____ Signature of Bidder _____	

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

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² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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132kV Nakonde - Isoka Line Loop-In - Loop-Out Double-Circuit Overhead Transmission Line (NI)				
SCHEDULE No. 7 - Dayworks Rates (Not for Evaluation)				
7.0	DAYWORK RATES	QTY	UOM	UNIT RATE
7.1	Prices for miscellaneous steel work, prices for special towers, special extensions and modifications (inclusive of design)			
7,1,1	Structural high yield steel	1	tonne	
7,1,2	Structural mild steel	1	tonne	
7.2	Miscellaneous prices for foundation work inclusive of design			
7,2,1	Special foundation work including pile caps, beams and modifications to normal foundations to adapt specified foundation classes to cater for particular soil conditions.			
7,2,1,1	Lean concrete (grade C12/15), including formwork	1	cubic m.	
7,2,1,2	Reinforced concrete (grade C30/37), including formwork	1	cubic m.	
7,2,1,3	Excavation in normal soils (including reinstatement)	1	cubic m.	
7,2,1,2	Excavation in hard rock, excluding class 1 foundations (including reinstatement)	1	cubic m.	
7,2,1,5	Steel reinforcement bars including supply, bending and placing	1	tonne	
7,2,1,6	Imported backfill	1	cubic m.	
7,2,1,7	Rip-rap stone work, 0.5m deep over tower base area to protect against erosion	1	square meter	
7,2,1,8	1m x 1m x 2m rock filled gabion baskets, installed, to protect foundations against erosion	1	linear m.	
7.3	Transmission Line Diversions: Complete profile survey and setting out of a diversion to the original line route including preparation of profiles and drawings, including complete ground line and conductor clearance checks, selection of tower types, pegging of tower positions, preparation of diagonal profiles including sub-soil investigations.	1	Route km	
7.4	Transmission Line Diversions: Route clearance and construction of all required access and maintenance roads	1	Route km	
7.5	Galvanized steel gates to be installed where access routes cross fenced property boundaries	1	Lot	
7.6	200mm wearing coarse layer to be installed on access roads	1	km	
7.7	Cost of earthing metallic roofs of buildings	1	per building	
7.8	Cost of earthing metallic fences	1	per connection	
7.9	Special Foundations Rates (Not classified under foundation classes 1 - 6)			
7.9.1	Additional depth concrete (m³)	1	(m³)	
7.9.2	Rock excavation (m³)	1	(m³)	
7.9.3	Micro-piles (m)	1	m	
7.9.4	Soil improvement (m³)	1	(m³)	
7.9.5	Dewatering (LS per location)	1	LS per location	
7.9.6	Re-spotting (each)	1	each	
Name of Bidder:				
Signature of Bidder:				

Schedule of Rates and Prices

Package 3: Construction of Double Circuit 400kV, 330kV, and 132kV Transmission Lines

Part B: 330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)

Name of Bidder:

Signature of Bidder: _____

330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)							
SCHEDULE 1: Plant and Mandatory Spare Parts Supplied from Abroad							
Item No	Description	Code ¹	Unit	Qty. (1)	Unit Price ²		Total Price ²
					[Specify Currency (2)]	(CIP, Kasama/Nakond e) (3)]	[Specify Currency (1)]x(3)
Plant for 330 kV Kasama-Nakonde d.c. OHTL							
1.00	Towers 330 kV Double Circuit OHTL Complete delivery of suspension tower 330DA (0° to 2° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
1.01	Type 330DA Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	526			0.00
1.02	Type 330DA Tower 3,0 m Body Extension (only)		per tower	66			0.00
1.03	Type 330DA Tower 6,0 m Body Extension (only)		per tower	13			0.00
1.04	Type 330DA Tower 9,0 m Body Extension (only)		per tower	6			0.00
1.05	Type 330DA Tower 12,0 m Body Extension (only)		per tower	1			0.00
1.06	Type 330DA Tower 15,0 m Body Extension (only)		per tower	1			0.00
1.07	Type 330DA Tower 1,0 m Leg Extension		each	526			0.00
1.08	Type 330DA Tower 2,0 m Leg Extension		each	421			0.00
1.09	Type 330DA Tower 3,0 m Leg Extension		each	210			0.00
1.10	Type 330DA Tower 4,0 m Leg Extension		each	63			0.00
1.11	Type 330DA Tower 5,0 m Leg Extension		each	63			0.00
1.12	Stubs for Type 330DA tower		each	2104			0.00
	SUB-TOTAL						0.00
2.00	Complete delivery of angle/anti-cascading tension tower, 330DB (0° to 10° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
2.01	Type 330DB Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	37			0.00
2.02	Type 330DB Tower 3,0 m Body Extension (only)		per tower	0			0.00
2.03	Type 330DB Tower 6,0 m Body Extension (only)		per tower	4			0.00
2.04	Type 330DB Tower 9,0 m Body Extension (only)		per tower	0			0.00
2.05	Type 330DB Tower 12,0 m Body Extension (only)		per tower	1			0.00
2.06	Type 330DB Tower 15,0 m Body Extension (only)		per tower	0			0.00
2.07	Type 330DB Tower 1,0 m Leg Extension		each	37			0.00
2.08	Type 330DB Tower 2,0 m Leg Extension		each	30			0.00
2.09	Type 330DB Tower 3,0 m Leg Extension		each	15			0.00
2.10	Type 330DB Tower 4,0 m Leg Extension		each	4			0.00
2.11	Type 330DB Tower 5,0 m Leg Extension		each	4			0.00
2.12	Stubs for Type 330DB tower		each	148			0.00
	SUB-TOTAL						0.00
3.00	Complete delivery-of angle tension tower 330DC (10° to 30° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all						

	necessary fittings, and all connections to the insulator strings.						
3.01	Type 330DC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	7			0.00
3.02	Type 330DC Tower 3,0 m Body Extension (only)		per tower	0			0.00
3.03	Type 330DC Tower 6,0 m Body Extension (only)		per tower	0			0.00
3.04	Type 330DC Tower 9,0 m Body Extension (only)		per tower	0			0.00
3.05	Type 330DC Tower 12,0 m Body Extension (only)		per tower	0			0.00
3.06	Type 330DC Tower 15,0 m Body Extension (only)		per tower	0			0.00
3.07	Type 330DC Tower 1,0 m Leg Extension		each	7			0.00
3.08	Type 330DC Tower 2,0 m Leg Extension		each	6			0.00
3.09	Type 330DC Tower 3,0 m Leg Extension		each	3			0.00
3.10	Type 330DC Tower 4,0 m Leg Extension		each	1			0.00
3.11	Type 330DC Tower 5,0 m Leg Extension		each	1			0.00
3.12	Stubs for Type 330DC tower		each	28			0.00
	SUB-TOTAL						0.00
4.00	Complete delivery of angle tension tower 330DD (30° to 60° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
4.01	Type 330DD Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	11			0.00
4.02	Type 330DD Tower 3,0 m Body Extension (only)		per tower	0			0.00
4.03	Type 330DD Tower 6,0 m Body Extension (only)		per tower	0			0.00
4.04	Type 330DD Tower 9,0 m Body Extension (only)		per tower	1			0.00
4.05	Type 330DD Tower 12,0 m Body Extension (only)		per tower	0			0.00
4.06	Type 330DD Tower 1,0 m Leg Extension		each	11			0.00
4.07	Type 330DD Tower 2,0 m Leg Extension		each	9			0.00
4.08	Type 330DD Tower 3,0 m Leg Extension		each	4			0.00
4.09	Type 330DD Tower 4,0 m Leg Extension		each	1			0.00
4.10	Type 330DD Tower 5,0 m Leg Extension		each	1			0.00
4.11	Stubs for Type 330DD tower		each	44			0.00
	SUB-TOTAL						0.00
5.00	Complete delivery of angle tension tower 330DE (60° to 90° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
5.01	Type 330DE Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	6			0.00
5.02	Type 330DE Tower 3,0 m Body Extension (only)		per tower	0			0.00
5.03	Type 330DE Tower 6,0 m Body Extension (only)		per tower	0			0.00
5.04	Type 330DE Tower 9,0 m Body Extension (only)		per tower	1			0.00
5.05	Type 330DE Tower 12,0 m Body Extension (only)		per tower	0			0.00
5.06	Type 330DE Tower 1,0 m Leg Extension		each	6			0.00
5.07	Type 330DE Tower 2,0 m Leg Extension		each	5			0.00
5.08	Type 330DE Tower 3,0 m Leg Extension		each	2			0.00
5.09	Type 330DE Tower 4,0 m Leg Extension		each	1			0.00
5.10	Type 330DE Tower 5,0 m Leg Extension		each	1			0.00
5.11	Stubs for Type 330DE tower		each	24			0.00
	SUB-TOTAL						0.00

6.00	Complete delivery of terminal tension tower 330DET (0° to 45° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
6.01	Type 330DET Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	2			0.00
6.02	Type 330DET Tower 3,0 m Body Extension (only)		per tower	0			0.00
6.03	Type 330DET Tower 6,0 m Body Extension (only)		per tower	0			0.00
6.04	Type 330DET Tower 9,0 m Body Extension (only)		per tower	0			0.00
6.05	Type 330DET Tower 1,0 m Leg Extension		each	2			0.00
6.06	Type 330DET Tower 2,0 m Leg Extension		each	2			0.00
6.07	Type 330DET Tower 3,0 m Leg Extension		each	1			0.00
6.08	Type 330DET Tower 4,0 m Leg Extension		each	0			0.00
6.09	Type 330DET Tower 5,0 m Leg Extension		each	0			0.00
6.10	Stubs for Type 330DET tower		each	8			0.00
SUB-TOTAL							0.00
7.00	Complete delivery of transposition tension tower 330DT (0° to 10° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
7.01	Type 330DT Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per transposition	2			0.00
7.02	Type 330DT Tower 3,0 m Body Extension (only)		per transposition	1			0.00
7.03	Type 330DT Tower 6,0 m Body Extension (only)		per transposition	1			0.00
7.04	Type 330DT Tower 1,0 m Leg Extension		each	2			0.00
7.05	Type 330DT Tower 2,0 m Leg Extension		each	2			0.00
7.06	Type 330DT Tower 3,0 m Leg Extension		each	1			0.00
7.07	Type 330DT Tower 4,0 m Leg Extension		each	1			0.00
7.08	Type 330DT Tower 5,0 m Leg Extension		each	1			0.00
7.09	Stubs for Type 330DT tower		each	8			0.00
SUB-TOTAL							0.00
8A	Foundations 330 kV Double Circuit OHTL All Foundations Material for tower types according to the specification, all necessary reinforcement, shuttering material, complete tower earthing material and their connections to tower.						
8.00	Complete delivery of foundations material from abroad for tower type: Suspension tower 330DA (0° to 2° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "10A" above						
8.01	Foundation class 1		set	1			0.00
8.02	Foundation class 2		set	10			0.00
8.03	Foundation class 3		set	84			0.00
8.04	Foundation class 4		set	142			0.00
8.05	Foundation class 4W		set	281			0.00
8.06	Foundation class 5		set	1			0.00
8.07	Foundation class 5W		set	5			0.00
8.08	Foundation class 6		set	2			0.00
SUB-TOTAL							0.00

9.00	Complete delivery of foundations material from abroad for tower type:angle/anti-cascading tension tower 330DB (0° to 10° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "10A" above						
9.01	Foundation class 1		set	1			0.00
9.02	Foundation class 2		set	2			0.00
9.03	Foundation class 3		set	8			0.00
9.04	Foundation class 4		set	8			0.00
9.05	Foundation class 4W		set	15			0.00
9.06	Foundation class 5		set	1			0.00
9.07	Foundation class 5W		set	1			0.00
9.08	Foundation class 6		set	1			0.00
	SUB-TOTAL						0.00
10.00	Complete delivery of foundations material from abroad for tower type:angle tension tower 330DC (10° to 30° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "10A" above						
10.01	Foundation class 1		set	1			0.00
10.02	Foundation class 2		set	1			0.00
10.03	Foundation class 3		set	1			0.00
10.04	Foundation class 4		set	1			0.00
10.05	Foundation class 4W		set	1			0.00
10.06	Foundation class 5		set	1			0.00
10.07	Foundation class 5W		set	1			0.00
10.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
11.00	Complete delivery of foundations material from abroad for tower type:angle tension tower 330DD (30° to 60° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "10A" above						
11.01	Foundation class 1		set	1			0.00
11.02	Foundation class 2		set	1			0.00
11.03	Foundation class 3		set	2			0.00
11.04	Foundation class 4		set	2			0.00
11.05	Foundation class 4W		set	2			0.00
11.06	Foundation class 5		set	1			0.00
11.07	Foundation class 5W		set	1			0.00
11.08	Foundation class 6		set	1			0.00
	SUB-TOTAL						0.00
12.00	Complete delivery of foundations material from abroad for tower type:angle tension tower 330DE (60° to 90° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "10A" above						
12.01	Foundation class 1		set	0			0.00
12.02	Foundation class 2		set	1			0.00
12.03	Foundation class 3		set	1			0.00
12.04	Foundation class 4		set	1			0.00
12.05	Foundation class 4W		set	1			0.00
12.06	Foundation class 5		set	1			0.00
12.07	Foundation class 5W		set	1			0.00
12.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
13.00	Complete delivery of foundations material from abroad for tower type:terminal tension tower 330DET (0° to 45° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "10A" above						
13.01	Foundation class 1		set	0			0.00
13.02	Foundation class 2		set	0			0.00
13.03	Foundation class 3		set	0			0.00

13.04	Foundation class 4		set	1			0.00
13.05	Foundation class 4W		set	1			0.00
13.06	Foundation class 5		set	0			0.00
13.07	Foundation class 5W		set	0			0.00
13.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
14.00	Complete delivery of foundations material from abroad for tower type: transposition tower 330DT (0° to 10° angle) Delivery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "10A" above						
14.01	Foundation class 1		set	0			0.00
14.02	Foundation class 2		set	0			0.00
14.03	Foundation class 3		set	1			0.00
14.04	Foundation class 4		set	0			0.00
14.05	Foundation class 4W		set	1			0.00
14.06	Foundation class 5		set	0			0.00
14.07	Foundation class 5W		set	0			0.00
14.08	Foundation class 6	-	set	0			0.00
	SUBTOTAL						0.00
15.00	Aircraft warning system						
15.01	Aircraft warning spheres		each	40			0.00
15.10	Fall Arrest System		set	10			0.00
	SUB-TOTAL						0.00
16.00	Earthing 330 kV Double circuit OHTL Supply of material for tower groundings, galvanised steel grounding Rod with 20mm diameter, 0.3mm coating thickness, 1.5m length including CCS40 copper clad steel wire strand 7 No.7 AWG, threaded couplers for earth rods, earthing rod clamps, bolted tower connector clamp, C-tap compression connectors, etc. as specified in Employers Requirements.						
16.01	Supply of counterpoise cable, for connection to the substation earthing grid including CCS40 copper clad steel wire strand 7 No.7 AWG, bolted tower connector clamp, C-tap compression connectors as specified in Employers Requirements		km	3			0.00
16.02	Supply of material for Earthing Type A, as specified in Employers Requirements.		each	591			0.00
16.03	Supply of material for Earthing Type B, as specified in Employers Requirements.		each	414			0.00
16.04	Supply of material for Earthing Type C, as specified in Employers Requirements.		each	118			0.00
16.05	Earthing enhancements for Type D where required as per specification to achieve specified tower footing resistance		each	59			0.00
	SUB-TOTAL						0.00
17.00	Insulator and Fittings 330 kV Double circuit OHTL LINE CONDUCTOR INSULATORS AND FITTINGS Supply of Complete Insulator Sets including insulators, all types of clamps, armour rods, extension links, pilot insulator sets, counterweights for connections to all Towers.						
17.01	Single Suspension insulator set for twin "BISON" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends		set	3048			0.00
17.02	Double Suspension insulator set for twin "BISON" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends.		set	108			0.00
17.03	Double Tension insulator set for twin "BISON" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends		set	780			0.00
17.04	Twin spacer damper for "BISON" conductor bundle		each	21276			0.00
17.05	Counter weights for reduction of insulator swing		set	168			0.00
	SUB-TOTAL						0.00

18.00	CONDUCTOR , OPGW AND GROUND WIRES Supply of conductors, OPGW and ground wires, including all joints, sleeves, jumper loops, spacers and necessary dampers, earthing connections and all downloads as per Employers Requirements.						
18.01	ACSR Conductor Code Name BISON; twin bundled, stringing of double circuit		route km	212			0.00
18.02	Optical Ground Wire (OPGW) 48 cores. ITU-T G.652D s/c rating 200 kA ² /sec, including all splicing and connections to joint boxes.		route km	212			0.00
18.03	Earth Wire (OHGW) type ACS 7/6 AWG		route km	212			0.00
18.04	Stockbridge type vibration dampers for BISON conductor		each	15744			0.00
18.05	Stockbridge type vibration dampers for OPGW		each	2253			0.00
18.06	Stockbridge type vibration dampers for Earth Wire type ACS 7/6 AWG		each	1312			0.00
18.07	Mid - span tension joint for BISON conductor		each	1310			0.00
18.08	Mid - span tension joint for Earth Wire OHGW		each	55			0.00
18.09	Repair sleeve for BISON conductor		each	127			0.00
	SUB-TOTAL						0.00
19.00	OPGW AND OVER HEAD GROUND WIRE FITTINGS AND ACCESSORIES Supply of complete sets of fittings, including all types of clamps, extension links, armor rods, counterweights, earth bonds and all connections to Towers. All cost for Employer's inspector during test shall be covered as per Employers Requirement Section VII Part II.						
19.01	Suspension set for OPGW		each	526			0.00
19.02	Straight through double tension set for OPGW		each	63			0.00
19.03	Double dead end tension set, including down the tower connection to joint box on suspension or tension tower for OPGW		each	65			0.00
19.04	Tension terminal dead end down set for OPGW		each	2			0.00
19.05	Jointing Box for OPGW/OPGW, for use within the transmission line, including fixing, splicing and download clamps, with feed through sets, suitable for up to 48 cores. ITU 652D s/c rating 200 kA ² /sec and OPGW, types as per specification		each	53			0.00
19.06	4 way Jointing Box for OPGW/OPGW/OFC, for use within the transmission line, including fixing, splicing and download clamps, with feed through sets, suitable for up to 48 cores. ITU 652D s/c rating 200 kA ² /sec and OPGW, types as per specification		each	2			0.00
19.07	Terminal Box for OPGW/OFC, for the connection at substation gantry, including fixing, splicing and download clamps, for up to 48 cores. ITU G-652D s/c rating 200 kA ² /sec and OPGW/OFC, types as per specification		each	2			0.00
19.08	Suspension set for Earth Wire (OHGW)		each	526			0.00
19.09	Straight through double tension set for Earth Wire (OHGW)		each	63			0.00
19.10	Double dead end tension set, including down the tower connection to joint box on suspension or tension tower for Earth Wire (OHGW)		each	65			0.00
19.11	Tension terminal dead end down set for Earth Wire (OHGW)		each	2			0.00
	SUB-TOTAL						0.00
20.00	Tools and Equipment						
20.01	Complete set of spanners for tower erection		set	10			0.00
20.02	SCHMIDT CONCRETE TEST HAMMER Impact Energy: 2.207 Nm Compression Strength: 10 – 70 MPa (1,450 – 10,152 psi) Product Dimension: 53 x 356 mm, Dia.x H Purchased equipment should meet the above specifications or better		each	2			0.00

20.03	ULTRA SONIC PULSE VELOCITY TESTER Range: 0.1 – 7930µs Resolution: 0.1µs (<793µs), 1µs (>793µs) Temperature range: -10°C - 50°C (Non Charging) Humidity: <95% RH, non condensing Memory Capacity: Internal 8 GB Flash memory Display: 7in color display 800 x 480 pixels Power supply: Lithium Polymer, 3.6V, 14.0Ah Product dimension: 250 x 162 x 62mm, WxDxH Purchased equipment should meet the above specifications or better		each	2			0.00
20.04	REBAR COVER METER Cover Measuring Range: Up to 185mm Accuracy: 4.1mm Power Supply: Rechargeable AA Batteries Product dimensions: 250 x 130 x 45mm, WxDxH Purchased equipment should meet the above specifications or better		each	2			0.00
20.05	Punching tool, for holes 12mm, 16mm and 20mm diameter in bracings up to 10mm thick		each	10			0.00
20.06	Conductor "stockings" for pulling conductor to fit ACSR "BISON"		each	12			0.00
20.07	5 Ton hydraulic petrol operated Tower Erection winch		each	2			0.00
20.08	Sagging Rollers for each conductor type (ACSR Bison, ACS 7/7 AWG, OPGW)		each type	12			0.00
20.09	16mm dia. Steel wire rope (100m lengths)		each	6			0.00
20.10	Nylon slings (5 Ton SWL)		each	20			0.00
20.11	Twin conductor running blocks		each	5			0.00
20.12	Pre-formed armoured type Repair Sleeves for ACSR "BISON"		each	50			0.00
20.13	Compression type repair sleeves for ACSR "BISON"		each	50			0.00
20.14	3 ton pullift		each	10			0.00
20.15	3 ton tirfor c/w bond		each	5			0.00
20.16	come along clamp (Riganti or Klein) for ACSR "BISON" conductor		each	12			0.00
20.17	tandem come along clamp (Riganti or Klein) for ACSR "BISON" conductor		each	12			0.00
20.18	come along clamp (Riganti or Klien) for ACS earth wire		each	6			0.00
20.19	come along clamp (Riganti or Klein) for OPGW earth wire		each	6			0.00
20.20	Motorised jointing compression tool c/w with compressing head and full set of dies for ACS "7/6 AWG" earthwire, ACSR "Wolf", ACSR "95/55", ACSR "Bison", and ACSR "Bluejay" conductors, including 2 sets of high pressure hoses, one set short and one long for use up the tower.		each	2			0.00
20.21	Sash Ropes 16mm dia.(100m lengths)		each	5			0.00
20.22	GNSS receiver complete set with rover, base and processing software with 2 spare batteries		each	2			0.00
20.23	Trimble Digital Level complete set with staff and processing software with 2 spare batteries		each	2			0.00
20.24	Leica Total Station		each	2			0.00
20.25	Handheld GPS, Garmin GPSMAP 65s or similar		each	8			0.00
20.26	GIS Tablet (Geotab)		each	2			0.00
20.27	Laser Range Finder		each	4			0.00
20.28	Binocular equipment with high focusing lense and distance measurement		each	8			0.00
20.29	Digital camera		each	8			0.00
20.30	Drone with LiDAR Survey Kit & Thermal Combo as DJI ENTERPRISE - MATRICE 350 RTK or equivalent and approved		each	1			0.00
20.31	Live Line Tester up to 330kV HIGH VOLTAGE DETECTORS CABLE TO DETECT VOLTAGE UP TO 500kV Type: Electronic capacitive, Operating power, voltage: 90 – 500kV, Instruction Manual, Connecting accessories including auxiliary earth,		each	10			0.00

	rod and probe; Application: For detecting voltages on overhead transmission lines						
20.32	HIGH FREQUENCY EARTH RESISTANCE MEASURING INSTRUMENT DIGITAL GROUND TESTER Application: For high frequency determination of earthing resistance of overhead transmission line towers with tower-top earth wire Operating voltage: Battery, Facility for charging battery: built-in		each	10			0.00
20.33	6 ton Chain Blocks		each	20			0.00
20.34	100kN Roller Blocks		each	12			0.00
20.35	GROUNDING STICKS SET : Type: screw type contact clamp; Suitable conductor diameter 5mm -60 mm; Maximum current capacity 23.9kA		each	20			0.00
20.36	Earth Resistance Tester - accuracy from 0.1 ohms to not less than 2000 ohms		each	6			0.00
20.37	Mechanical and electrical tool box complete		each	10			0.00
20.38	Walkie Talkie: 2 way radios		each	4			0.00
20.39	Single Phase Gen-welder Machine		each	6			0.00
20.40	Three Phase Gen-welder Machine		each	6			0.00
20.41	Safety belts		each	50			0.00
	SUB-TOTAL						0.00
21.00	SPARES						
21.01	CONDUCTOR , OPGW AND GROUND WIRES						
21.02	Double ACSR "Bison" Conductor		km	15			0.00
21.03	ACS Earth Conductor		km	20			0.00
21.04	OPGW Conductor		km	40			0.00
21.05	Spare Copper Clad Steel		km	10			0.00
21.06	OPGW joint box		each	10			0.00
21.07	OPGW splicing tool. (Machine) complete with all accessories		each	3			0.00
21.08	OTDR		each	3			0.00
21.09	Counterpoise conductor		km	10			0.00
21.10	LINE CONDUCTOR INSULATORS AND FITTINGS						
21.11	Double tension insulator set complete with all fittings for ACSR "Bison"		each	20			0.00
21.12	Single suspension insulator set complete with all fittings for ACSR "Bison"		each	100			0.00
21.13	Complete tension set for OPGW earth wire (pair)		each	10			0.00
21.14	Complete suspension set for OPGW earth wire		each	20			0.00
21.15	Complete tension set for ACS earth wire (single)		each	10			0.00
21.16	Complete suspension set for ACS earth wire		each	20			0.00
21.17	OVERHEAD LINE ACCESSORIES						
21.18	Assortment of tower bolts		tonne	4			0.00
21.19	Assortment of anti-theft type tower bolts		tonne	1			0.00
21.20	Mid-span joints for ACSR "BISON" Compression type.		each	25			0.00
21.21	Vibration Dampers for ACSR "BISON"		each	100			0.00
21.22	Tension Clamps for ACSR "BISON"		each	30			0.00
21.23	Suspension clamps complete with preformed armour rods for ACSR "BISON"		each	50			0.00
21.24	Spacers for twin ACSR "BISON"		each	100			0.00
21.25	Vibration Dampers for ACS Earth wire		each	50			0.00
21.26	Vibration Dampers for OPGW Earth wire		each	50			0.00
21.27	Midspan joint for ACS earth wire		each	10			0.00
21.28	AIRCRAFT WARNING SYSTEM						
21.29	Aircraft warning spheres		each	10			0.00
21.30	330kV COMPLETE SPARE TOWERS WITH BOLTS, ALL WITH STANDARD LEGS						
21.31	Type 330DA Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		each	5			0.00

21.32	Type 330DB Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		each	3			0.00
21.33	Type 330DC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		each	2			0.00
21.34	Type 330DD Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		each	1			0.00
21.35	Type 330DE Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		each	1			0.00
21.36	Type 330DET Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		each	1			0.00
21.37	Type 330DT Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		each	1			0.00
21.38	Additional tower legs. All members & bolts, excluding main legs.						
21.39	Tower type 330DA						
21.40	Type 330DA Tower 1,0 m Leg Extension		each	1			0.00
21.41	Type 330DA Tower 2,0 m Leg Extension		each	1			0.00
21.42	Type 330DA Tower 3,0 m Leg Extension		each	1			0.00
21.43	Type 330DA Tower 4,0 m Leg Extension		each	0			0.00
21.44	Type 330DA Tower 5,0 m Leg Extension		each	0			0.00
21.45	Stubs for Type 330DA tower		each	20			0.00
21.46	Tower type 330DB						
21.47	Type 330DB Tower 1,0 m Leg Extension		each	1			0.00
21.48	Type 330DB Tower 2,0 m Leg Extension		each	1			0.00
21.49	Type 330DB Tower 3,0 m Leg Extension		each	1			0.00
21.50	Type 330DB Tower 4,0 m Leg Extension		each	0			0.00
21.51	Type 330DB Tower 5,0 m Leg Extension		each	0			0.00
21.52	Stubs for Type 330DB tower		each	12			0.00
21.53	Tower type 330DC						
21.54	Type 330DC Tower 1,0 m Leg Extension		each	1			0.00
21.55	Type 330DC Tower 2,0 m Leg Extension		each	1			0.00
21.56	Type 330DC Tower 3,0 m Leg Extension		each	0			0.00
21.57	Type 330DC Tower 4,0 m Leg Extension		each	0			0.00
21.58	Type 330DC Tower 5,0 m Leg Extension		each	0			0.00
21.59	Stubs for Type 330DC tower		each	8			0.00
21.60	Tower type 330DD						
21.61	Type 330DD Tower 1,0 m Leg Extension		each	0			0.00
21.62	Type 330DD Tower 2,0 m Leg Extension		each	1			0.00
21.63	Type 330DD Tower 3,0 m Leg Extension		each	0			0.00
21.64	Type 330DD Tower 4,0 m Leg Extension		each	0			0.00
21.65	Type 330DD Tower 5,0 m Leg Extension		each	0			0.00
21.66	Stubs for Type 330DD tower		each	4			0.00
21.67	Tower type 330DE						
21.68	Type 330DE Tower 1,0 m Leg Extension		each	0			0.00
21.69	Type 330DE Tower 2,0 m Leg Extension		each	1			0.00
21.70	Type 330DE Tower 3,0 m Leg Extension		each	0			0.00
21.71	Type 330DE Tower 4,0 m Leg Extension		each	0			0.00
21.72	Type 330DE Tower 5,0 m Leg Extension		each	0			0.00
21.73	Stubs for Type 330DE tower		each	4			0.00
21.74	Tower type 330DET						
21.75	Type 330DET Tower 1,0 m Leg Extension		each	0			0.00
21.76	Type 330DET Tower 2,0 m Leg Extension		each	1			0.00
21.77	Type 330DET Tower 3,0 m Leg Extension		each	0			0.00
21.78	Type 330DET Tower 4,0 m Leg Extension		each	0			0.00
21.79	Type 330DET Tower 5,0 m Leg Extension		each	0			0.00
21.80	Stubs for Type 330DET tower		each	4			0.00
21.81	Tower type 330DT						
21.82	Type 330DT Tower 1,0 m Leg Extension		each	0			0.00
21.83	Type 330DT Tower 2,0 m Leg Extension		each	1			0.00
21.84	Type 330DT Tower 3,0 m Leg Extension		each	0			0.00
21.85	Type 330DT Tower 4,0 m Leg Extension		each	0			0.00
21.86	Type 330DT Tower 5,0 m Leg Extension		each	0			0.00
21.87	Stubs for Type 330DT tower		each	4			0.00
	SUB-TOTAL						0.00

	TOTAL (To Schedule No. 5, Grand Summary)	0.00
	Name of Bidder	
	Signature of Bidder	

¹ Bidders shall enter a code representing the country of origin of all imported plant and equipment.

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

Country of Origin Declaration Form

Item	Description	Code	Country

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330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)						
SCHEDULE 2: Plant and Mandatory Spare Parts Supplied from within the Employer's Country						
Item No	Description	Unit	Qty. (1)	Unit Price ² (EXW-Zambia) (2)	Sales and other taxes payable per line item if Contract is awarded (in accordance with ITB 17.5 (b) (ii) (3)	Total Price ² (1)x(2)
				(ZMW)	(ZMW)	(ZMW)
Plant and Installation of 330 kV Kasama-Nakonde OHTL						
	Foundations 330 kV Double Circuit OHTL Local Supply of Foundation material for steel tower types according to the specification, and according to drawings and regulations of the Employer. All foundation must have a chimney height above ground of minimum 500mm.					
1.00	Local delivery of foundations material for tower type: Suspension tower 330DA (0° to 2° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
1.01	Foundation class 1	set	1			0.00
1.02	Foundation class 2	set	10			0.00
1.03	Foundation class 3	set	84			0.00
1.04	Foundation class 4	set	142			0.00
1.05	Foundation class 4W	set	281			0.00
1.06	Foundation class 5	set	1			0.00
1.07	Foundation class 5W	set	5			0.00
1.08	Foundation class 6	set	2			0.00
	SUB-TOTAL				0.00	0.00
2.00	Local delivery of foundations material for tower type:angle/anti-cascading tension tower 330DB (0° to 10° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
2.01	Foundation class 1	set	1			0.00
2.02	Foundation class 2	set	2			0.00
2.03	Foundation class 3	set	8			0.00
2.04	Foundation class 4	set	8			0.00
2.05	Foundation class 4W	set	15			0.00
2.06	Foundation class 5	set	1			0.00
2.07	Foundation class 5W	set	1			0.00
2.08	Foundation class 6	set	1			0.00
	SUB-TOTAL				0.00	0.00
3.00	Local delivery of foundations material for tower type: angle tension tower 330DC (10° to 30° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
3.01	Foundation class 1	set	1			0.00
3.02	Foundation class 2	set	1			0.00
3.03	Foundation class 3	set	1			0.00
3.04	Foundation class 4	set	1			0.00
3.05	Foundation class 4W	set	1			0.00
3.06	Foundation class 5	set	1			0.00
3.07	Foundation class 5W	set	1			0.00
3.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00

4.00	Local delivery of foundations material for tower type: angle tension tower 330DD (30° to 60° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
4.01	Foundation class 1	set	1			0.00
4.02	Foundation class 2	set	1			0.00
4.03	Foundation class 3	set	2			0.00
4.04	Foundation class 4	set	2			0.00
4.05	Foundation class 4W	set	2			0.00
4.06	Foundation class 5	set	1			0.00
4.07	Foundation class 5W	set	1			0.00
4.08	Foundation class 6	set	1			0.00
	SUB-TOTAL				0.00	0.00
5.00	Local delivery of foundations material for tower type: angle tension tower 330DE (60° to 90° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
5.01	Foundation class 1	set	0			0.00
5.02	Foundation class 2	set	1			0.00
5.03	Foundation class 3	set	1			0.00
5.04	Foundation class 4	set	1			0.00
5.05	Foundation class 4W	set	1			0.00
5.06	Foundation class 5	set	1			0.00
5.07	Foundation class 5W	set	1			0.00
5.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
6.00	Local delivery of foundations material for tower type: terminal tension tower 330DET (0° to 45° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
6.01	Foundation class 1	set	0			0.00
6.02	Foundation class 2	set	0			0.00
6.03	Foundation class 3	set	0			0.00
6.04	Foundation class 4	set	1			0.00
6.05	Foundation class 4W	set	1			0.00
6.06	Foundation class 5	set	0			0.00
6.07	Foundation class 5W	set	0			0.00
6.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
7.00	Local delivery of foundations material for tower type: transposition tower 330DT (0° to 10° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
7.01	Foundation class 1	set	0			0.00
7.02	Foundation class 2	set	0			0.00
7.03	Foundation class 3	set	1			0.00
7.04	Foundation class 4	set	0			0.00
7.05	Foundation class 4W	set	1			0.00
7.06	Foundation class 5	set	0			0.00
7.07	Foundation class 5W	set	0			0.00
7.08	Foundation class 6	set	0			0.00
	SUBTOTAL				0.00	0.00
8.00						
8.01						0.00
8.02						0.00
8.03						0.00
8.04						0.00
8.05						0.00
8.06						0.00
8.07						0.00
8.08						0.00
8.09						0.00
8.10						0.00
	SUB-TOTAL				0.00	0.00

9.00							
9.01						0.00	
9.02						0.00	
9.03						0.00	
9.04						0.00	
9.05						0.00	
9.06						0.00	
9.07						0.00	
9.08						0.00	
9.09						0.00	
9.10						0.00	
	SUB-TOTAL				0.00	0.00	
10.00							
10.01						0.00	
10.02						0.00	
10.03						0.00	
10.04						0.00	
10.05						0.00	
10.06						0.00	
10.07						0.00	
10.08						0.00	
10.09						0.00	
10.10						0.00	
	SUB-TOTAL				0.00	0.00	
11.00							
11.01						0.00	
11.02						0.00	
11.03						0.00	
11.04						0.00	
11.05						0.00	
11.06						0.00	
11.07						0.00	
11.08						0.00	
11.09						0.00	
11.10						0.00	
	SUB-TOTAL				0.00	0.00	
12.00							
12.01						0.00	
12.02						0.00	
12.03						0.00	
12.04						0.00	
12.05						0.00	
12.06						0.00	
12.07						0.00	
12.08						0.00	
12.09						0.00	
12.10						0.00	
	SUB-TOTAL				0.00	0.00	
	TOTAL (To Schedule No. 5, Grand Summary)					0.00	0.00
	Name of Bidder:						
	Signature of Bidder:						

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)							
Item No	Description	Unit	Qty. (1)	Unit Price ²		Total Price ²	
						Local Portion	Foreign Portion
				Local Currency Portion	Foreign Currency Portion	[Specify Currency]	
1.00	Survey activities like tower spotting, survey of crossing objects including pegging of towers, diagonal profiles and all necessary documentation for the OHTL, soil investigations and route clearing & access roads.		1)	2)	3)	(1)x(2)	(1)x(3)
1.10	Survey, final alignment, tower plotting, preparation of plan, and profile drawings and tower schedule.	route km	212			0.00	0.00
1.20	Sub-soil investigation at each support locations by means of in situ DCPT (Dynamic Cone Penetrometer Test), vane test or bearing test as defined in the scope of works	tower	591			0.00	0.00
1.30	Sub-soil investigation at each support locations by means of machine boring, including all necessary drilling, sampling, soil penetration test (SPT), establishment of ground water level, laboratory testing and determination of soil/water aggressiveness	tower	591			0.00	0.00
1.40	Clearing the right-of-way & construction of all required access and maintenance roads including Installation of wayleave demarcation reinforced cement concrete markers .	Lot	1			0.00	0.00
2.00	Foundation Design (All types)	Lot	1			0.00	0.00
3.00	Tower Design (All types)	Lot	1			0.00	0.00
4.00	Insulator Design (All types)	Lot	1			0.00	0.00
5.00	Soil Resistivity recording and Earthing system design	Lot	1			0.00	0.00
6.00	Preparation of all general and detailed documents, maps and annexes complete in all aspects	Lot	1			0.00	0.00
7.00	Preparation of 'As-built' drawings	Lot	1			0.00	0.00
8.00	Geotechnical Survey, Analysis and reporting	Lot	1			0.00	0.00
9.00	Foundation Design type test to ultimate or destructive for all foundations other than pad and chimney, including mobilization and erection of all test equipment and installation of the standard footing (the number of test specimen shall be the greater of (i) 1% of the total number of foundations and (ii) two (2).	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
	TOTAL (To Schedule No. 5, Grand Summary)					0.00	0.00
	Name of Bidder:						
	Signature of Bidder:						

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)							
SCHEDULE 4: Installation Services (Erection, Testing and Commissioning)							
Item No	Description	Unit	Qty.	Unit Price ²		Total	
				Local Currency Portion	Foreign Currency Portion	Foreign Portion	Local Portion
						[Specify Currency]	[Specify Currency]
0.00	Preliminaries 330 kV Kasama-Nakonde OHTL		1)	2)	3)	(1)x(2)	(1)x(3)
	Site Mobilization						
0.01	Mobilization, Store Yards, contractor personal, Site Office for contractor at localized area. Note: Including 132kV Kasama-Nakonde and 400kV Nakonde-Tanzania border.	Lot	1			0.00	0.00
0.02	Mobilization of construction equipment as per evaluation and qualification criteria. Note: Including 132kV Kasama-Nakonde and 400kV Nakonde-Tanzania border.	Lot	1			0.00	0.00
0.03A	<i>Construction of access roads complete with the finger access roads from public roads as per Employer's Requirements</i>	Lot	1			0.00	0.00
0.03B	<i>Bush clearing as per Employer's Requirements</i>	Lot	1			0.00	0.00
0.04	Insurance. Note: Including 132kV Kasama-Nakonde and 400kV Nakonde-Tanzania border.	Lot	1			0.00	0.00
0.05	Site demobilization. Note: Including 132kV Kasama-Nakonde and 400kV Nakonde-Tanzania border.	Lot	1			0.00	0.00
0.06	Water and Builder's supply. Note: Including 132kV Kasama-Nakonde and 400kV Nakonde-Tanzania border.	Lot	1			0.00	0.00
0.07	<i>Appropriate slope or tower footing protection against erosion for one-third of the total towers</i>	Lot	1			0.00	0.00
0.071	Grassing	Lot	1			0.00	0.00
0.072	Stone pitching	Lot	1			0.00	0.00
0.073	Rip-rap	Lot	1			0.00	0.00
0.074	Gabions	Lot	1			0.00	0.00
0.075	Terracing/cribbing	Lot	1			0.00	0.00
0.08	Installation of reinforced concrete markers along the ROW	Lot	1			0.00	0.00
0.09	<i>Gravelled Access road</i>	km	20			0.00	0.00
	SUB-TOTAL					0.00	0.00
	Installation and other services of 330 kV Kasama-Nakonde OHTL						
1A	Foundations 330 kV Double Circuit OHTL Installation of all foundations for tower types according to the specification, including all transport, excavation, installation of stubs, all necessary reinforcement, shuttering, concreting, backfilling, compacting, erosion protection, complete tower earthing and their connections to tower, measuring of earth resistance and submitting of records to Employer/Engineer, according to drawings and regulations of the Employer. Soil class definition concerning permissible soil pressure is according to Employer's design and specifications. All foundation must have a chimney height above ground of minimum 500mm.						
1.00	Complete installation works of foundations for tower type: Suspension tower 330DA (0° to 2° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
1.01	Foundation class 1	set	1			0.00	0.00
1.02	Foundation class 2	set	10			0.00	0.00
1.03	Foundation class 3	set	84			0.00	0.00

1.04	Foundation class 4	set	142			0.00	0.00
1.05	Foundation class 4W	set	281			0.00	0.00
1.06	Foundation class 5	set	1			0.00	0.00
1.07	Foundation class 5W	set	5			0.00	0.00
1.08	Foundation class 6	set	2			0.00	0.00
	SUB-TOTAL					0.00	0.00
2.00	Complete installation works of foundations for tower type:angle/anti-cascading tension tower 330DB (0° to 10° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
2.01	Foundation class 1	set	1			0.00	0.00
2.02	Foundation class 2	set	2			0.00	0.00
2.03	Foundation class 3	set	8			0.00	0.00
2.04	Foundation class 4	set	8			0.00	0.00
2.05	Foundation class 4W	set	15			0.00	0.00
2.06	Foundation class 5	set	1			0.00	0.00
2.07	Foundation class 5W	set	1			0.00	0.00
2.08	Foundation class 6	set	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
3.00	Complete installation works of foundations for tower type:angle tension tower 330DC (10° to 30° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
3.01	Foundation class 1	set	1			0.00	0.00
3.02	Foundation class 2	set	1			0.00	0.00
3.03	Foundation class 3	set	1			0.00	0.00
3.04	Foundation class 4	set	1			0.00	0.00
3.05	Foundation class 4W	set	1			0.00	0.00
3.06	Foundation class 5	set	1			0.00	0.00
3.07	Foundation class 5W	set	1			0.00	0.00
3.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
4.00	Complete installation works of foundations for tower type:angle tension tower 330DD (30° to 60° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
4.01	Foundation class 1	set	1			0.00	0.00
4.02	Foundation class 2	set	1			0.00	0.00
4.03	Foundation class 3	set	2			0.00	0.00
4.04	Foundation class 4	set	2			0.00	0.00
4.05	Foundation class 4W	set	2			0.00	0.00
4.06	Foundation class 5	set	1			0.00	0.00
4.07	Foundation class 5W	set	1			0.00	0.00
4.08	Foundation class 6	set	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
5.00	Complete installation works of foundations for tower type:angle tension tower 330DE (60° to 90° angle) Including complete materials, Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
5.01	Foundation class 1	set	0			0.00	0.00
5.02	Foundation class 2	set	1			0.00	0.00
5.03	Foundation class 3	set	1			0.00	0.00
5.04	Foundation class 4	set	1			0.00	0.00
5.05	Foundation class 4W	set	1			0.00	0.00
5.06	Foundation class 5	set	1			0.00	0.00
5.07	Foundation class 5W	set	1			0.00	0.00
5.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00

6.00	Complete installation works of foundations for tower type:terminal tension tower 330DET (0° to 45° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
6.01	Foundation class 1	set	0			0.00	0.00
6.02	Foundation class 2	set	0			0.00	0.00
6.03	Foundation class 3	set	0			0.00	0.00
6.04	Foundation class 4	set	1			0.00	0.00
6.05	Foundation class 4W	set	1			0.00	0.00
6.06	Foundation class 5	set	0			0.00	0.00
6.07	Foundation class 5W	set	0			0.00	0.00
6.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
7.00	Complete installation works of foundations for tower type: transposition tower 330DT (0° to 10° angle) Including all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works, and in "1A" above						
7.01	Foundation class 1	set	0			0.00	0.00
7.02	Foundation class 2	set	0			0.00	0.00
7.03	Foundation class 3	set	1			0.00	0.00
7.04	Foundation class 4	set	0			0.00	0.00
7.05	Foundation class 4W	set	1			0.00	0.00
7.06	Foundation class 5	set	0			0.00	0.00
7.07	Foundation class 5W	set	0			0.00	0.00
7.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
1B	Complete installation of all foundations for tower types according to the specification of 330 kV Double Circuit OHTL in Euphorbia Area according to Employer's Requirements Including all special transport, excavation, installation of stubs, all necessary reinforcement, shuttering, concreting, backfilling, compacting, erosion protection, complete tower earthing and their connections to tower, measuring of earth resistance and submitting of records to Employer/Engineer, according to drawings and regulations of the Employer. Soil class definition concerning permissible soil pressure is according to Employer's design and specifications.	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	
8.00	Towers 330 kV Twin Bundle Conductor Double Circuit OHTLComplete installation of suspension tower 330DA (0° to 2° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
8.01	Type 330DA Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	526			0.00	0.00
8.02	Type 330DA Tower 3,0 m Body Extension (only)	per tower	66			0.00	0.00
8.03	Type 330DA Tower 6,0 m Body Extension (only)	per tower	13			0.00	0.00
8.04	Type 330DA Tower 9,0 m Body Extension (only)	per tower	6			0.00	0.00
8.05	Type 330DA Tower 12,0 m Body Extension (only)	per tower	1			0.00	0.00
8.06	Type 330DA Tower 15,0 m Body Extension (only)	per tower	1			0.00	0.00
8.07	Type 330DA Tower 1,0 m Leg Extension	each	526			0.00	0.00
8.08	Type 330DA Tower 2,0 m Leg Extension	each	421			0.00	0.00
8.09	Type 330DA Tower 3,0 m Leg Extension	each	210			0.00	0.00
8.10	Type 330DA Tower 4,0 m Leg Extension	each	63			0.00	0.00
8.11	Type 330DA Tower 5,0 m Leg Extension	each	63			0.00	0.00
8.12	Stubs for Type 330DA tower	each	2104			0.00	0.00

8.13	Erection and installation of hot dip galvanised lattice steel towers in Euphorbia Area according to Employer's Requirements	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
9.00	Complete installation of angle/anti-cascading tension tower, 330DB (0° to 10° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
9.01	Type 330DB Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	37			0.00	0.00
9.02	Type 330DB Tower 3,0 m Body Extension (only)	per tower	0			0.00	0.00
9.03	Type 330DB Tower 6,0 m Body Extension (only)	per tower	4			0.00	0.00
9.04	Type 330DB Tower 9,0 m Body Extension (only)	per tower	0			0.00	0.00
9.05	Type 330DB Tower 12,0 m Body Extension (only)	per tower	1			0.00	0.00
9.06	Type 330DB Tower 15,0 m Body Extension (only)	per tower	0			0.00	0.00
9.07	Type 330DB Tower 1,0 m Leg Extension	each	37			0.00	0.00
9.08	Type 330DB Tower 2,0 m Leg Extension	each	30			0.00	0.00
9.09	Type 330DB Tower 3,0 m Leg Extension	each	15			0.00	0.00
9.10	Type 330DB Tower 4,0 m Leg Extension	each	4			0.00	0.00
9.11	Type 330DB Tower 5,0 m Leg Extension	each	4			0.00	0.00
9.12	Stubs for Type 330DB tower	each	148			0.00	0.00
	SUB-TOTAL					0.00	0.00
10.00	Complete installation of angle tension tower 330DC (10° to 30° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
10.01	Type 330DC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	7			0.00	0.00
10.02	Type 330DC Tower 3,0 m Body Extension (only)	per tower	0			0.00	0.00
10.03	Type 330DC Tower 6,0 m Body Extension (only)	per tower	0			0.00	0.00
10.04	Type 330DC Tower 9,0 m Body Extension (only)	per tower	0			0.00	0.00
10.05	Type 330DC Tower 12,0 m Body Extension (only)	per tower	0			0.00	0.00
10.06	Type 330DC Tower 15,0 m Body Extension (only)	per tower	0			0.00	0.00
10.07	Type 330DC Tower 1,0 m Leg Extension	each	7			0.00	0.00
10.08	Type 330DC Tower 2,0 m Leg Extension	each	6			0.00	0.00
10.09	Type 330DC Tower 3,0 m Leg Extension	each	3			0.00	0.00
10.10	Type 330DC Tower 4,0 m Leg Extension	each	1			0.00	0.00
10.11	Type 330DC Tower 5,0 m Leg Extension	each	1			0.00	0.00
10.11	Stubs for Type 330DC tower	each	28			0.00	0.00
	SUB-TOTAL					0.00	0.00
11.00	Complete installation of angle tension tower 330DD (30° to 60° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
11.01	Type 330DD Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	11			0.00	0.00
11.02	Type 330DD Tower 3,0 m Body Extension (only)	per tower	0			0.00	0.00
11.03	Type 330DD Tower 6,0 m Body Extension (only)	per tower	0			0.00	0.00

11.04	Type 330DD Tower 9,0 m Body Extension (only)	per tower	1			0.00	0.00
11.05	Type 330DD Tower 12,0 m Body Extension (only)	per tower	0			0.00	0.00
11.06	Type 330DD Tower 1,0 m Leg Extension	each	11			0.00	0.00
11.07	Type 330DD Tower 2,0 m Leg Extension	each	9			0.00	0.00
11.08	Type 330DD Tower 3,0 m Leg Extension	each	4			0.00	0.00
11.09	Type 330DD Tower 4,0 m Leg Extension	each	1			0.00	0.00
11.10	Type 330DD Tower 5,0 m Leg Extension	each	1			0.00	0.00
11.11	Stubs for Type 330DD tower	each	44			0.00	0.00
SUB-TOTAL						0.00	0.00
12.00	Complete installation of angle tension tower 330DE (60° to 90° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
12.01	Type 330DE Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	6			0.00	0.00
12.02	Type 330DE Tower 3,0 m Body Extension (only)	per tower	0			0.00	0.00
12.03	Type 330DE Tower 6,0 m Body Extension (only)	per tower	0			0.00	0.00
12.04	Type 330DE Tower 9,0 m Body Extension (only)	per tower	1			0.00	0.00
12.05	Type 330DE Tower 12,0 m Body Extension (only)	per tower	0			0.00	0.00
12.06	Type 330DE Tower 1,0 m Leg Extension	each	6			0.00	0.00
12.07	Type 330DE Tower 2,0 m Leg Extension	each	5			0.00	0.00
12.08	Type 330DE Tower 3,0 m Leg Extension	each	2			0.00	0.00
12.09	Type 330DE Tower 4,0 m Leg Extension	each	1			0.00	0.00
12.10	Type 330DE Tower 5,0 m Leg Extension	each	1			0.00	0.00
12.11	Stubs for Type 330DE tower	each	24			0.00	0.00
SUB-TOTAL						0.00	0.00
13.00	Complete installation of terminal tension tower 330DET (0° to 45° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
13.01	Type 330DET Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	2			0.00	0.00
13.02	Type 330DET Tower 3,0 m Body Extension (only)	per tower	0			0.00	0.00
13.03	Type 330DET Tower 6,0 m Body Extension (only)	per tower	0			0.00	0.00
13.04	Type 330DET Tower 9,0 m Body Extension (only)	per tower	0			0.00	0.00
13.05	Type 330DET Tower 1,0 m Leg Extension	each	2			0.00	0.00
13.06	Type 330DET Tower 2,0 m Leg Extension	each	2			0.00	0.00
13.07	Type 330DET Tower 3,0 m Leg Extension	each	1			0.00	0.00
13.08	Type 330DET Tower 4,0 m Leg Extension	each	0			0.00	0.00
13.09	Type 330DET Tower 5,0 m Leg Extension	each	0			0.00	0.00
13.10	Stubs for Type 330DET tower	each	8			0.00	0.00
SUB-TOTAL						0.00	0.00
14.00	Complete Installation of transposition tension tower 330DT (0° to 10° angle) as defined in the Scope of Works Erection and installation of hot dip galvanised lattice steel towers according to the design, including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
14.01	Type 330DT Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per transposition	2			0.00	0.00

14.02	Type 330DT Tower 3,0 m Body Extension (only)	per transposition	1			0.00	0.00
14.03	Type 330DT Tower 6,0 m Body Extension (only)	per transposition	1			0.00	0.00
14.04	Type 330DT Tower 1,0 m Leg Extension	each	2			0.00	0.00
14.05	Type 330DT Tower 2,0 m Leg Extension	each	2			0.00	0.00
14.06	Type 330DT Tower 3,0 m Leg Extension	each	1			0.00	0.00
14.07	Type 330DT Tower 4,0 m Leg Extension	each	1			0.00	0.00
14.08	Type 330DT Tower 5,0 m Leg Extension	each	1			0.00	0.00
14.09	Stubs for Type 330DT tower	each	8			0.00	0.00
SUB-TOTAL						0.00	0.00
15.00	TOWER LOAD TESTS AND FAT Tower Factory Acceptance Test (FAT) and Type test to ultimate loading including, supply, erection and dismantling. The test shall include a minimum of 6 (six) combination of loading cases, the testing station shall be accredited internationally to be used for tower test and all cost for Employer's inspector during test shall be as per Employer's Requirements.						
15.01	Tower type 330DA	Lot	1			0.00	0.00
15.02	Tower type 330DB	Lot	1			0.00	0.00
15.03	Tower type 330DC	Lot	1			0.00	0.00
15.04	Tower type 330DD	Lot	1			0.00	0.00
15.05	Tower type 330DE	Lot	1			0.00	0.00
15.06	Tower type 330DET	Lot	1			0.00	0.00
SUB-TOTAL						0.00	0.00
16.00	Aircraft warning system						
16.01	Aircraft warning spheres	each	40			0.00	0.00
16.10	Fall Arrest System	set	10			0.00	0.00
SUB-TOTAL						0.00	0.00
17.00	Earthing 330 kV Double circuit OHTL Installation Works - tower groundings including excavation, laying of counterpoise, connection to towers including all clamps and other connections, corrosion protection, backfilling, compaction and measuring of ohmic value. The protection against corrosion of chemical attack to the earthing systems shall be taken into consideration as specified Employer Requirements Sections VII.						
17.01	Installation of Supply of counterpoise cable, for connection to the substation earthing grid including CCS40 copper clad steel wire strand 7 No.7 AWG, bolted tower connector clamp, C-tap compression connectors as specified in Employers Requirements	km	3			0.00	0.00
17.02	Installation of Supply of material for Earthing Type A, as specified in Employers Requirements.	each	591			0.00	0.00
17.03	Installation of Supply of material for Earthing Type B, as specified in Employers Requirements.	each	414			0.00	0.00
17.04	Installation of Supply of material for Earthing Type C, as specified in Employers Requirements.	each	118			0.00	0.00
17.05	Installation of Earthing enhancements for Type D where required as per specification to achieve specified tower footing resistance	each	59			0.00	0.00
SUB-TOTAL						0.00	0.00
18.00	Insulator and Fittings 330 kV Double circuit OHTL LINE CONDUCTOR INSULATORS AND FITTINGS Installation of Complete Insulator Sets including insulators, all types of clamps, armour rods, extension links, pilot insulator sets, counterweights and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Schedule of Guarantee Characteristics						
18.01	Single Suspension insulator set for twin "BISON" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends	set	3048			0.00	0.00
18.02	Double Suspension insulator set for twin "BISON" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends.	set	108			0.00	0.00

18.03	Double Tension insulator set for twin "BISON" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends	set	780			0.00	0.00
18.04	Twin spacer damper for "BISON" conductor bundle	each	21276			0.00	0.00
18.05	Counter weights for reduction of insulator swing	set	168			0.00	0.00
18.06	Factory acceptance tests (FAT) for Insulators as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
18.07	Factory acceptance tests (FAT) Fittings and Accessories for Insulator as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
18.08	Test for arcing horn as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
18.09	Type Test for Insulator Strings as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
SUB-TOTAL						0.00	0.00
19.00	CONDUCTOR, OPGW AND GROUND WIRES Transport, stringing and installation including all joints, sleeves, jumper loops, spacers and necessary dampers, earthing connections and all downleads as per Employers Requirements. All cost for Employer's inspector during test shall be covered as per Employers Requirements						
19.01	ACSR Conductor Code Name BISON; twin bundled, stringing of double circuit	route km	212			0.00	0.00
19.02	Optical Ground Wire (OPGW) 48 cores. ITU-T G.652D s/c rating 200 kA2/sec , including all splicing and connections to joint boxes.	route km	212			0.00	0.00
19.03	Earth Wire (OHGW) type ACS 7/6 AWG	route km	212			0.00	0.00
19.04	Stockbridge type vibration dampers for BISON conductor	each	15744			0.00	0.00
19.05	Stockbridge type vibration dampers for OPGW	each	2253			0.00	0.00
19.06	Stockbridge type vibration dampers for Earth Wire type ACS 7/6 AWG	each	1312			0.00	0.00
19.07	Mid - span tension joint for BISON conductor	each	1310			0.00	0.00
19.08	Mid - span tension joint for Earth Wire OHGW	each	55			0.00	0.00
19.09	Repair sleeve for BISON conductor	each	127			0.00	0.00
19.10	Type test, Conductors as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
19.11	Type test, OPGW as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
19.12	Type test, OHGW Conductors as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
19.13	Factory acceptance tests (FAT), Conductor test as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.14	Factory acceptance tests (FAT), OPGW test as per Employer Requirement; Section VII, Part II	Lot	1			0.00	0.00
19.15	Factory acceptance tests (FAT), Earth Wire (OHGW) test as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.16	Factory acceptance tests (FAT), for space damper as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.17	Factory acceptance tests (FAT), for vibration damper as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.18	Factory acceptance tests (FAT), on suspension clamp for BISON conductor as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.19	Factory acceptance tests (FAT), on tension clamp for BISON conductor as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.20	Factory acceptance tests (FAT), on suspension clamp for overhead ground wire as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.21	Factory acceptance tests (FAT), on tension clamp for overhead ground wire as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.22	Factory acceptance tests (FAT), Test for joint sleeves for Conductor and Earth wire (OHGW) as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
19.23	Transport, stringing and installation including all joints, sleeves, jumper loops, spacers and necessary dampers, earthing connections and all downleads in Euphorbia Area as per Employers Requirements	Lot	1			0.00	0.00
SUB-TOTAL						0.00	0.00
20.00	OPGW AND OVER HEAD GROUND WIRE FITTINGS AND ACCESSORIES Installation of complete Sets of Fittings, including all types of clamps, extension links, armor rods, counterweights, earth bonds and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Employers Requirement section VII Part II.						
20.01	Suspension set for OPGW	each	526			0.00	0.00
20.02	Straight through double tension set for OPGW	each	63			0.00	0.00
20.03	Double dead end tension set, including down the tower connection to joint box on suspension or tension tower for OPGW	each	65			0.00	0.00
20.04	Tension terminal dead end down set for OPGW	each	2			0.00	0.00

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)			
SCHEDULE: No. 5 Grand Summary			
Item	Description	Total Price ¹	
		Foreign [Specify Currency]	Local (ZMW)
¹ Specify currency in accordance with requirements stipulated in Bid Data Sheet under ITB 18.1 & 18.2.			
	Total Schedule No. 1. Plant, and Mandatory Spare Parts Supplied from Abroad	0.00	
	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Within the Employer’s Country	0.00	0.00
	Total Schedule No. 3. Design Services	0.00	0.00
	Total Schedule No. 4. Installation and Other Services	0.00	0.00
	Total	0.00	0.00
		Name of Bidder _____	
		Signature of Bidder _____	

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

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¹ Bidders shall enter a code representing the country of origin of all imported plant and equipment.

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies.

¹ Bidders shall enter a code representing the country of origin of all imported plant and equipment.

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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330kV Kasama-Nakonde Stepdown D.C. Overhead Transmission Line (KN)**SCHEDULE No. 7 - Dayworks Rates (Not for Evaluation)**

7.0	DAYWORK RATES	QTY	UOM	UNIT RATE
7.1	Prices for miscellaneous steel work, prices for special towers, special extensions and modifications (inclusive of design)			
7,1,1	Structural high yield steel	1	tonne	
7,1,2	Structural mild steel	1	tonne	
7.2	Miscellaneous prices for foundation work inclusive of design			
7,2,1	Special foundation work including pile caps, beams and modifications to normal foundations to adapt specified foundation classes to cater for particular soil conditions.			
7,2,1,1	Lean concrete (grade C12/15), including formwork	1	cubic m.	
7,2,1,2	Reinforced concrete (grade C30/37), including formwork	1	cubic m.	
7,2,1,3	Excavation in normal soils (including reinstatement)	1	cubic m.	
7,2,1,2	Excavation in hard rock, excluding class 1 foundations (including reinstatement)	1	cubic m.	
7,2,1,5	Steel reinforcement bars including supply, bending and placing	1	tonne	
7,2,1,6	Imported backfill	1	cubic m.	
7,2,1,7	Rip -rap stone work, 0.5m deep over tower base area to protect against erosion	1	square meter	
7,2,1,8	1m x 1m x 2m rock filled gabion baskets, installed, to protect foundations against erosion	1	linear m.	
7.3	Transmission Line Diversions: Complete profile survey and setting out of a diversion to the original line route including preparation of profiles and drawings, including complete ground line and conductor clearance checks, selection of tower types, pegging of tower positions, preparation of diagonal profiles including sub-soil investigations.	1	Route km	
7.4	Transmission Line Diversions: Route clearance and construction of all required access and maintenance roads	1	Route km	
7.5	Galvanized steel gates to be installed where access routes cross fenced property boundaries	1	Lot	
7.6	200mm wearing coarse layer to be installed on access roads	1	km	
7.7	Cost of earthing metallic roofs of buildings	1	per building	
7.8	Cost of earthing metallic fences	1	per connection	
7.9	Special Foundations Rates (Not classified under foundation classes 1 - 6)			
7.9.1	Additional depth concrete (m ³)	1	(m ³)	
7.9.2	Rock excavation (m ³)	1	(m ³)	
7.9.3	Micro-piles (m)	1	m	
7.9.4	Soil improvement (m ³)	1	(m ³)	
7.9.5	Dewatering (LS per location)	1	LS per location	
7.9.6	Re-spotting (each)	1	each	
	Name of Bidder:			
	Signature of Bidder:			

Schedule of Rates and Prices

Package 3: Construction of Double Circuit 400kV, 330kV, and 132kV Transmission Lines

Part C: 400kV Nakonde-Tanzania Border Double-Circuit Overhead Transmission Line (NT)

Name of Bidder:

Signature of Bidder: _____

400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)							
SCHEDULE 1: Plant and Mandatory Spare Parts Supplied from Abroad							
Item No	Description	Code ¹	Unit	Qty. (1)	Unit Price ²		Total Price ²
					[Specify Currency]	(CIP Nakonde)	[Specify Currency] (1)x(3)
Plant and Installation of 400 kV Nakonde-Tanzania border OHTL							
1.00	Towers 400 kV Double Circuit OHTL Complete delivery of suspension tower 400DA (0° to 2° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
1.01	Type 400DA Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	31			0.00
1.02	Type 400DA Tower 3,0 m Body Extension (only)		each	12			0.00
1.03	Type 400DA Tower 6,0 m Body Extension (only)		each	2			0.00
1.04	Type 400DA Tower 9,0 m Body Extension (only)		each	2			0.00
1.05	Type 400DA Tower 12,0 m Body Extension (only)		each	0			0.00
1.06	Type 400DA Tower 15,0 m Body Extension (only)		each	0			0.00
1.07	Type 400DA Tower 1,0 m Leg Extension		each	31			0.00
1.08	Type 400DA Tower 2,0 m Leg Extension		each	25			0.00
1.09	Type 400DA Tower 3,0 m Leg Extension		each	12			0.00
1.10	Type 400DA Tower 4,0 m Leg Extension		each	4			0.00
1.11	Type 400DA Tower 5,0 m Leg Extension		each	4			0.00
1.12	Stubs for Type 400DA tower		each	124			0.00
	SUB-TOTAL						0.00
2.00	Complete delivery of angle/anti-cascading tension tower, 400DB (0° to 10° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
2.01	Type 400DB Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	1			0.00
2.02	Type 400DB Tower 3,0 m Body Extension (only)		each	0			0.00
2.03	Type 400DB Tower 6,0 m Body Extension (only)		each	0			0.00
2.04	Type 400DB Tower 9,0 m Body Extension (only)		each	0			0.00
2.05	Type 400DB Tower 12,0 m Body Extension (only)		each	0			0.00
2.06	Type 400DB Tower 15,0 m Body Extension (only)		each	0			0.00
2.07	Type 400DB Tower 1,0 m Leg Extension		each	1			0.00
2.08	Type 400DB Tower 2,0 m Leg Extension		each	1			0.00
2.09	Type 400DB Tower 3,0 m Leg Extension		each	1			0.00
2.10	Type 400DB Tower 4,0 m Leg Extension		each	0			0.00
2.11	Type 400DB Tower 5,0 m Leg Extension		each	0			0.00
2.12	Stubs for Type 400DB tower		each	4			0.00
	SUB-TOTAL						0.00

3.00	Complete delivery of angle tension tower 400DC (10° to 30° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
3.01	Type 400DC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	4			0.00
3.02	Type 400DC Tower 3,0 m Body Extension (only)		each	0			0.00
3.03	Type 400DC Tower 6,0 m Body Extension (only)		each	1			0.00
3.04	Type 400DC Tower 9,0 m Body Extension (only)		each	0			0.00
3.05	Type 400DC Tower 12,0 m Body Extension (only)		each	0			0.00
3.06	Type 400DC Tower 15,0 m Body Extension (only)		each	0			0.00
3.07	Type 400DC Tower 1,0 m Leg Extension		each	4			0.00
3.08	Type 400DC Tower 2,0 m Leg Extension		each	3			0.00
3.09	Type 400DC Tower 3,0 m Leg Extension		each	2			0.00
3.10	Type 400DC Tower 4,0 m Leg Extension		each	0			0.00
3.11	Type 400DC Tower 5,0 m Leg Extension		each	0			0.00
3.12	Stubs for Type 400DC tower		each	16			0.00
	SUB-TOTAL						0.00
4.00	Complete delivery of angle tension tower 400DD (30° to 60° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
4.01	Type 400DD Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	1			0.00
4.02	Type 400DD Tower 3,0 m Body Extension (only)		each	0			0.00
4.03	Type 400DD Tower 6,0 m Body Extension (only)		each	0			0.00
4.04	Type 400DD Tower 9,0 m Body Extension (only)		each	0			0.00
4.05	Type 400DD Tower 12,0 m Body Extension (only)		each	0			0.00
4.06	Type 400DD Tower 1,0 m Leg Extension		each	1			0.00
4.07	Type 400DD Tower 2,0 m Leg Extension		each	1			0.00
4.08	Type 400DD Tower 3,0 m Leg Extension		each	1			0.00
4.09	Type 400DD Tower 4,0 m Leg Extension		each	0			0.00
4.10	Type 400DD Tower 5,0 m Leg Extension		each	0			0.00
4.11	Stubs for Type 400DD tower		each	4			0.00
	SUB-TOTAL						0.00
5.00	Complete delivery of angle tension tower 400DE (60° to 90° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
5.01	Type 400DE Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	0			0.00
5.02	Type 400DE Tower 3,0 m Body Extension (only)		each	0			0.00
5.03	Type 400DE Tower 6,0 m Body Extension (only)		each	0			0.00
5.04	Type 400DE Tower 9,0 m Body Extension (only)		each	0			0.00
5.05	Type 400DE Tower 12,0 m Body Extension (only)		each	0			0.00
5.06	Type 400DE Tower 1,0 m Leg Extension		each	0			0.00
5.07	Type 400DE Tower 2,0 m Leg Extension		each	0			0.00
5.08	Type 400DE Tower 3,0 m Leg Extension		each	0			0.00
5.09	Type 400DE Tower 4,0 m Leg Extension		each	0			0.00
5.10	Type 400DE Tower 5,0 m Leg Extension		each	0			0.00
5.11	Stubs for Type 400DE tower		each	0			0.00
	SUB-TOTAL						0.00

6.00	Complete delivery of terminal tension tower 400DET (0° to 45° angle) as defined in the Scope of Works Supply of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings.						
6.01	Type 400DET Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions		per tower	2			0.00
6.02	Type 400DET Tower 3,0 m Body Extension (only)		each	0			0.00
6.03	Type 400DET Tower 6,0 m Body Extension (only)		each	0			0.00
6.04	Type 400DET Tower 9,0 m Body Extension (only)		each	0			0.00
6.05	Type 400DET Tower 1,0 m Leg Extension		each	2			0.00
6.06	Type 400DET Tower 2,0 m Leg Extension		each	2			0.00
6.07	Type 400DET Tower 3,0 m Leg Extension		each	1			0.00
6.08	Type 400DET Tower 4,0 m Leg Extension		each	0			0.00
6.09	Type 400DET Tower 5,0 m Leg Extension		each	0			0.00
6.10	Stubs for Type 400DET tower		each	8			0.00
	SUB-TOTAL						0.00
8A	Foundations 400 kV Double Circuit OHTL All Foundations Material for tower types according to the specification, all necessary reinforcement, shuttering material, complete tower earthing material and their connections to tower.						
7.00	Complete delivery of foundations for tower type: Suspension tower 400DA (0° to 2° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
7.01	Foundation class 1		set	1			0.00
7.02	Foundation class 2		set	3			0.00
7.03	Foundation class 3		set	9			0.00
7.04	Foundation class 4		set	4			0.00
7.05	Foundation class 4W		set	11			0.00
7.06	Foundation class 5		set	1			0.00
7.07	Foundation class 5W		set	1			0.00
7.08	Foundation class 6		set	1			0.00
	SUB-TOTAL						0.00
8.00	Complete delivery of foundations for tower type: angle/anti-cascading tension tower 400DB (0° to 10° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
8.01	Foundation class 1		set	0			0.00
8.02	Foundation class 2		set	0			0.00
8.03	Foundation class 3		set	1			0.00
8.04	Foundation class 4		set	0			0.00
8.05	Foundation class 4W		set	0			0.00
8.06	Foundation class 5		set	0			0.00
8.07	Foundation class 5W		set	0			0.00
8.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
9.00	Complete delivery of foundations for tower type: angle tension tower 400DC (10° to 30° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
9.01	Foundation class 1		set	0			0.00
9.02	Foundation class 2		set	1			0.00
9.03	Foundation class 3		set	1			0.00
9.04	Foundation class 4		set	1			0.00
9.05	Foundation class 4W		set	1			0.00

9.06	Foundation class 5		set	0			0.00
9.07	Foundation class 5W		set	0			0.00
9.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
10.00	Complete delivery of foundations for tower type:angle tension tower 400DD (30° to 60° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
10.01	Foundation class 1		set	0			0.00
10.02	Foundation class 2		set	0			0.00
10.03	Foundation class 3		set	0			0.00
10.04	Foundation class 4		set	0			0.00
10.05	Foundation class 4W		set	1			0.00
10.06	Foundation class 5		set	0			0.00
10.07	Foundation class 5W		set	0			0.00
10.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
11.00	Complete delivery of foundations for tower type:angle tension tower 400DE (60° to 90° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
11.01	Foundation class 1		set	0			0.00
11.02	Foundation class 2		set	0			0.00
11.03	Foundation class 3		set	0			0.00
11.04	Foundation class 4		set	0			0.00
11.05	Foundation class 4W		set	0			0.00
11.06	Foundation class 5		set	0			0.00
11.07	Foundation class 5W		set	0			0.00
11.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
12.00	Complete delivery of foundations for tower type:terminal tension tower 400DET (0° to 45° angle) Devilery of complete materials and equipment necessary for the construction of foundations as defined in the Scope of Works and in "8A" above						
12.01	Foundation class 1		set	0			0.00
12.02	Foundation class 2		set	0			0.00
12.03	Foundation class 3		set	1			0.00
12.04	Foundation class 4		set	1			0.00
12.05	Foundation class 4W		set	0			0.00
12.06	Foundation class 5		set	0			0.00
12.07	Foundation class 5W		set	0			0.00
12.08	Foundation class 6		set	0			0.00
	SUB-TOTAL						0.00
13.00	Earthing 400 kV Double circuit OHTL Supply of material for tower groundings, galvanised steel grounding Rod with 20mm diamater, 0.3mm coating thickness, 1,5m length including CCS40 copper clad steel wire strand 7 No.7 AWG, threaded couplers for earth rods, earthing rod clamps, bolted tower connector clamp, C-tap compression connectors, etc. as specified in Employers Requirements.						
13.01	Supply of counterpoise conductor, for connection to the substation earthing grid including CCS40 copper clad steel wire strand 7 No.7 AWG, bolted tower connector clamp, C-tap compression connectors as specified in Employers Requirements		km	1.5			0.00
13.02	Supply of material for Earthing Type A, as specified in Employers Requirements.		each	39			0.00
13.03	Supply of material for Earthing Type B, as specified in Employers Requirements.		each	27			0.00
13.04	Supply of material for Earthing Type C, as specified in Employers Requirements.		each	8			0.00

13.05	Earthing enhancements for Type D where required as per specification to achieve specified tower footing resistance		each	4			0.00
	SUB-TOTAL						0.00
14.00	Insulator and Fittings 400 kV Double Circuit OHTL LINE CONDUCTOR INSULATORS AND FITTINGS Supply of Complete Insulator Sets including insulators, all types of clamps, armour rods, extension links, pilot insulator sets, counterweights and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Schedule of Guarantee Characteristics. NOTE; Arcing horns shall be suitable/adjusted for the operating voltage, 330kV, at least 2km out from Nakonde Stepdown substation.						
14.01	Single Suspension insulator set for twin "Bluejay" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends		each	162			0.00
14.02	Double Suspension insulator set for twin "Bluejay" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends.		each	24			0.00
14.03	Double Tension insulator set for twin "Bluejay" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends		each	96			0.00
14.04	Twin spacer damper for "Bluejay" conductor bundle		each	1404			0.00
14.05	Counter weights for reduction of insulator swing		each	12			0.00
	SUB-TOTAL						0.00
15.00	CONDUCTOR, OPGW AND GROUND WIRES Supply, stringing and installation including all joints, sleeves, jumper loops, spacers and necessary dampers, earthing connections and all downloads as per Employers Requirements. All cost for Employer's inspector during test shall be covered as per Employers Requirements						
15.01	ACSR Conductor code name Bluejay; twin bundled, stringing of double circuit		route km	15			0.00
15.02	Optical Ground Wire (OPGW) type ACSR 95/55, 48 cores (24+24), ITU-T G.655 and ITU-T G.652D s/c rating 200 kA ² /sec, including all splicing and connections to joint boxes.		route km	15			0.00
15.03	Earth Wire (OHGW) type ACSR 95/55		route km	15			0.00
15.04	Stockbridge type vibration dampers for Bluejay conductor		each	1128			0.00
15.05	Stockbridge type vibration dampers for OPGW type ACSR 95/55		each	153			0.00
15.06	Stockbridge type vibration dampers for Earth Wire type ACSR 95/55		each	94			0.00
15.07	Mid - span tension joint for Bluejay conductor		each	93			0.00
15.08	Mid - span tension joint for Earth Wire OHGW type ACSR 95/55		each	4			0.00
15.09	Repair sleeve for Bluejay conductor		each	9			0.00
	SUB-TOTAL						0.00
15.10	Fall Arrest System		set	5			0.00
	SUB-TOTAL						0.00
16.00	OPGW AND OVER HEAD GROUND WIRE FITTINGS AND ACCESSORIES Supply of complete Sets of Fittings, including all types of clamps, extension links, armor rods, counterweights, earth bonds and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Employers Requirement section VII Part II.						
16.01	Suspension set for OPGW		each	31			0.00
16.02	Straight through double tension set for OPGW		each	14			0.00
16.03	Double dead end tension set, including down the tower connection to joint box on suspension or tension tower for OPGW		each	8			0.00
16.04	Tension terminal dead end down set for OPGW		each	2			0.00
16.05	Joining Box for OPGW/OPGW, for use within the transmission line, including fixing, splicing and download clamps, with feed through sets, suitable for up to 48 cores. ITU-T G.655 and ITU 652D s/c rating 200 kA ² /sec and OPGW, types as per specification		each	4			0.00
16.06	4 way Joining Box for OPGW/OPGW/OFC, for use within the transmission line, including fixing, splicing and download clamps, with feed through sets, suitable for up to 48 cores.		each	2			0.00

	ITU-T G.655 and ITU 652D s/c rating 200 kA ² /sec and OPGW, types as per specification						
16.07	Terminal Box for OPGW/OFC, for the connection at substation gantry, including fixing, splicing and download clamps, for up to 48 cores. ITU-T G.655 and ITU G-652D s/c rating 200 kA ² /sec and OPGW/OFC, types as per specification	each	2				0.00
16.08	Suspension set for Earth Wire (OHGW)	each	31				0.00
16.09	Straight through double tension set for Earth Wire (OHGW)	each	14				0.00
16.10	Double dead end tension set, including down the tower connection to joint box on suspension or tension tower for Earth Wire (OHGW)	each	8				0.00
16.11	Tension terminal dead end down set for Earth Wire (OHGW)	each	2				0.00
	SUB-TOTAL						0.00
17.00	Tools and Equipment						
17.01	Conductor "stockings" for pulling conductor to fit ACSR "Bluejay"	each	12				0.00
17.02	Pre-formed armoured type Repair Sleeves for ACSR "Bluejay"	each	25				0.00
17.03	Compression type repair sleeves for ACSR "Bluejay"	each	25				0.00
17.04	come along clamp (Riganti or Klein) for ACSR "Bluejay" conductor	each	12				0.00
17.05	tandem come along clamp (Riganti or Klein) for ACSR "Bluejay" conductor	each	12				0.00
17.06	come along clamp (Riganti or Klien) for ACSR 95/55 earth wire	each	6				0.00
17.07	come along clamp (Riganti or Klein) for OPGW earth wire	each	6				0.00
	SUB-TOTAL						0.00
18.00	SPARES						
18.01	CONDUCTOR , OPGW AND GROUND WIRES						
18.02	Spare double ACSR "Bluejay" Conductor	km	5				0.00
18.03	Spare ACSR 95/55 Earth Conductor	km	5				0.00
18.04	Spare OPGW Conductor type ACSR 95/55	km	5				0.00
18.05	Counterpoise conductor	km	2.5				0.00
18.06	LINE CONDUCTOR INSULATORS AND FITTINGS						
18.07	Double tension insulator set complete with all fittings for ACSR "Bluejay"	each	6				0.00
18.08	Single suspension insulator set complete with all fittings for ACSR "Bluejay"	each	10				0.00
18.09	Complete tension set for OPGW earth wire (pair)	each	4				0.00
18.10	Complete suspension set for OPGW earth wire	each	4				0.00
18.11	Complete tension set for ACSR 95/55 earth wire (single)	each	4				0.00
18.12	Complete suspension set for ACSR 95/55 earth wire	each	6				0.00
18.13	OVERHEAD LINE ACCESSORIES						
18.14	Assortment of tower bolts	tonne	1				0.00
18.15	Assortment of anti-theft type tower bolts	tonne	1				0.00
18.16	Mid-span joints for ACSR "Bluejay" Compression type.	each	6				0.00
18.17	Vibration Dampers for ACSR "Bluejay"	each	24				0.00
18.18	Tension Clamps for ACSR "Bluejay"	each	6				0.00
18.19	Suspension clamps complete with preformed armour rods for ACSR "Bluejay"	each	12				0.00
18.20	Spacers for twin ACSR "Bluejay"	each	20				0.00
18.21	Vibration Dampers for ACSR 95/55 Earth wire	each	10				0.00
18.22	Vibration Dampers for OPGW Earth wire	each	10				0.00
18.23	Midspace joint for ACSR 95/55 earth wire	each	5				0.00
	SUB-TOTAL						0.00
	TOTAL (To Schedule No. 5, Grand Summary)						0.00

Name of
Bidder _____

Signature
of Bidder _____

¹ Bidders shall enter a code representing the country of origin of all imported plant and equipment.

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

Country of Origin Declaration Form

Item	Description	Code	Country

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400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)						
SCHEDULE 2: Plant and Mandatory Spare Parts Supplied from within the Employer's Country						
Item No	Description	Unit	Qty. (1)	Unit Price ² (EXW-Zambia) (2)	Sales and other taxes payable per line item if Contract is awarded (in accordance with ITB 17.5 (b) (ii) (3)	Total Price ² (1)x(2)
				(ZMW)	(ZMW)	(ZMW)
Plant and Installation of 400 kV Nakonde-Tanzania border OHTL						
	Foundations 400 kV Double Circuit OHTL Locally Supply of Foundation material for steel tower types according to the specification, and according to drawings and regulations of the Employer. All foundation must have a chimney height above ground of minimum 500mm.					
1.00	Local delivery of foundations material for tower type: Suspension tower 400DA (0° to 2° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
1.01	Foundation class 1	set	1			0.00
1.02	Foundation class 2	set	3			0.00
1.03	Foundation class 3	set	9			0.00
1.04	Foundation class 4	set	4			0.00
1.05	Foundation class 4W	set	11			0.00
1.06	Foundation class 5	set	1			0.00
1.07	Foundation class 5W	set	1			0.00
1.08	Foundation class 6	set	1			0.00
	SUB-TOTAL				0.00	0.00
2.00	Local delivery of foundations material for tower type: angle/anti-cascading tension tower 400DB (0° to 10° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
2.01	Foundation class 1	set	0			0.00
2.02	Foundation class 2	set	0			0.00
2.03	Foundation class 3	set	1			0.00
2.04	Foundation class 4	set	0			0.00
2.05	Foundation class 4W	set	0			0.00
2.06	Foundation class 5	set	0			0.00
2.07	Foundation class 5W	set	0			0.00
2.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
3.00	Local delivery of foundations material for tower type: angle tension tower 400DC (10° to 30° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
3.01	Foundation class 1	set	0			0.00
3.02	Foundation class 2	set	1			0.00
3.03	Foundation class 3	set	1			0.00
3.04	Foundation class 4	set	1			0.00
3.05	Foundation class 4W	set	1			0.00
3.06	Foundation class 5	set	0			0.00
3.07	Foundation class 5W	set	0			0.00
3.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00

4.00	Local delivery of foundations material for tower type: angle tension tower 400DD (30° to 60° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
4.01	Foundation class 1	set	0			0.00
4.02	Foundation class 2	set	0			0.00
4.03	Foundation class 3	set	0			0.00
4.04	Foundation class 4	set	0			0.00
4.05	Foundation class 4W	set	1			0.00
4.06	Foundation class 5	set	0			0.00
4.07	Foundation class 5W	set	0			0.00
4.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
5.00	Local delivery of foundations material for tower type: angle tension tower 400DE (60° to 90° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
5.01	Foundation class 1	set	0			0.00
5.02	Foundation class 2	set	0			0.00
5.03	Foundation class 3	set	0			0.00
5.04	Foundation class 4	set	0			0.00
5.05	Foundation class 4W	set	0			0.00
5.06	Foundation class 5	set	0			0.00
5.07	Foundation class 5W	set	0			0.00
5.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
6.00	Local delivery of foundations material for tower type: terminal tension tower 400DET (0° to 45° angle) Including complete materials necessary for the construction of foundations as defined in the Scope of Works					
6.01	Foundation class 1	set	0			0.00
6.02	Foundation class 2	set	0			0.00
6.03	Foundation class 3	set	1			0.00
6.04	Foundation class 4	set	1			0.00
6.05	Foundation class 4W	set	0			0.00
6.06	Foundation class 5	set	0			0.00
6.07	Foundation class 5W	set	0			0.00
6.08	Foundation class 6	set	0			0.00
	SUB-TOTAL				0.00	0.00
7.00						
7.01						0.00
7.02						0.00
7.03						0.00
7.04						0.00
7.05						0.00
7.06						0.00
7.07						0.00
7.08						0.00
7.09						0.00
7.10						0.00
	SUBTOTAL				0.00	0.00
8.00						
8.01						0.00
8.02						0.00
8.03						0.00
8.04						0.00
8.05						0.00
8.06						0.00
8.07						0.00
8.08						0.00
8.09						0.00
8.10						0.00
	SUBTOTAL				0.00	0.00

9.00						
9.01						0.00
9.02						0.00
9.03						0.00
9.04						0.00
9.05						0.00
9.06						0.00
9.07						0.00
9.08						0.00
9.09						0.00
9.10						0.00
					0.00	0.00
	TOTAL (To Schedule No. 5, Grand Summary)				0.00	0.00
	Name of Bidder:					
	Signature of Bidder:					

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)							
SCHEDULE 3: Design Services							
Item No	Description	Unit	Qty. (1)	Unit Price ²		Total Price ²	
						Foreign Portion	Local Portion
				Local Currency Portion	Foreign Currency Portion	[Specify Currency]	[Specify Currency]
1.00	Survey activities like tower spotting, survey of crossing objects including pegging of towers, diagonal profiles and all necessary documentation for the OHTL, soil investigations and route clearing & access roads.		1)	2)	3)	(1)x(2)	(1)x(3)
1.10	Survey, final alignment, tower plotting, preparation of plan, and profile drawings and tower schedule.	route km	15			0.00	0.00
1.20	Sub-soil investigation at support locations by means of in situ DCPT (Dynamic Cone Penetrometer Test), vane test or bearing test as defined in the scope of works	tower	39			0.00	0.00
1.30	Sub-soil investigation at support locations by means of machine boring, including all necessary drilling, sampling, soil penetration test (SPT), establishment of ground water level, laboratory testing and determination of soil/water aggressiveness	tower	39			0.00	0.00
1.40	Clearing the right-of-way & construction of all required access and maintenance roads including Installation of wayleave demarcation reinforced cement concrete markers .	Lot	1			0.00	0.00
1.50	Geotechnical Survey, Analysis and reporting	Lot	1			0.00	0.00
2.00	Foundation Design (All types)	Lot	1			0.00	0.00
3.00	Tower Design (All types)	Lot	1			0.00	0.00
4.00	Insulator Design (All types)	Lot	1			0.00	0.00
5.00	Foundation Design type test to ultimate or destructive for all foundations other than pad and chimney, including mobilization and erection of all test equipment and installation of the standard footing (the number of test specimen shall be the greater of (i) 1% of the total number of foundations and (ii) two (2)).	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
	TOTAL (To Schedule No. 5, Grand Summary)					0.00	0.00
	Name of Bidder:						
	Signature of Bidder:						

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)							
SCHEDULE 4: Installation Services (Erection, Testing and Commissioning)							
Item	Description	Unit	Qty. (1)	Unit Price ²		Total Price ²	
				Local Currency Portion	Foreign Currency Portion	Local Portion	Foreign Portion
						[Specify Currency]	[Specify Currency]
0.00	Preliminaries 400 kV Nakonde-Tanzania border OHTL		1)	2)	3)	(1)x(2)	(1)x(3)
	Site Mobilization						
0.01	Mobilization, Store Yards, contractor personal, Site Office for contractor at localized area. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.02	Mobilization of construction equipment as per evaluation and qualification criteria. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.03A	<i>Construction of access roads complete with the finger access roads from public roads as per Employer's Requirements</i>	Lot	1			0.00	0.00
0.03B	<i>Bush clearing as per Employer's Requirements</i>	Lot	1			0.00	0.00
0.04	Insurance. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.05	Site demobilization. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.06	Water and Builder's supply. Note: Shall be included in the 330 kV Kasama-Nakonde line Price Schedule.	Lot	0			0.00	0.00
0.07	<i>Appropriate slope or tower footing protection against erosion for one-third of the total towers</i>	Lot	1			0.00	0.00
0.071	Grassing	Lot	1			0.00	0.00
0.072	Stone pitching	Lot	1			0.00	0.00
0.073	Rip-rap	Lot	1			0.00	0.00
0.074	Gabions	Lot	1			0.00	0.00
0.075	Terracing/cribbing	Lot	1			0.00	0.00
0.08	Installation of reinforced concrete markers along the ROW	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
	Installation and other services of 400kV Nakonde-Tanzania border OHTL						
	Foundations 400 kV Double Circuit OHTL All Foundations for tower types according to the specification, including all transport, excavation, installation of stubs, all necessary reinforcement, shuttering, concreting, backfilling, compacting, erosion protection, complete tower earthing and their connections to tower, measuring of earth resistance and submitting of records to Employer/Engineer, according to drawings and regulations of the Employer. Soil class definition concerning permissible soil pressure is according to Employer's design and specifications. All foundation must have a chimney height above ground of minimum 500mm.						
1.00	Complete installation of foundations for tower type: Suspension tower 400DA (0° to 2° angle) Including complete materials, all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works						
1.01	Foundation class 1	set	1			0.00	0.00
1.02	Foundation class 2	set	3			0.00	0.00
1.03	Foundation class 3	set	9			0.00	0.00
1.04	Foundation class 4	set	4			0.00	0.00
1.05	Foundation class 4W	set	11			0.00	0.00
1.06	Foundation class 5	set	1			0.00	0.00
1.07	Foundation class 5W	set	1			0.00	0.00
1.08	Foundation class 6	set	1			0.00	0.00

	SUB-TOTAL					0.00	0.00
2.00	Complete installation of foundations for tower type: angle/anti-cascading tension tower 400DB (0° to 10° angle) Including complete materials, all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works						
2.01	Foundation class 1	set	0			0.00	0.00
2.02	Foundation class 2	set	0			0.00	0.00
2.03	Foundation class 3	set	1			0.00	0.00
2.04	Foundation class 4	set	0			0.00	0.00
2.05	Foundation class 4W	set	0			0.00	0.00
2.06	Foundation class 5	set	0			0.00	0.00
2.07	Foundation class 5W	set	0			0.00	0.00
2.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
3.00	Complete installation of foundations for tower type: angle tension tower 400DC (10° to 30° angle) Including complete materials, all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works						
3.01	Foundation class 1	set	0			0.00	0.00
3.02	Foundation class 2	set	1			0.00	0.00
3.03	Foundation class 3	set	1			0.00	0.00
3.04	Foundation class 4	set	1			0.00	0.00
3.05	Foundation class 4W	set	1			0.00	0.00
3.06	Foundation class 5	set	0			0.00	0.00
3.07	Foundation class 5W	set	0			0.00	0.00
3.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
4.00	Complete installation of foundations for tower type: angle tension tower 400DD (30° to 60° angle) Including complete materials, all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works						
4.01	Foundation class 1	set	0			0.00	0.00
4.02	Foundation class 2	set	0			0.00	0.00
4.03	Foundation class 3	set	0			0.00	0.00
4.04	Foundation class 4	set	0			0.00	0.00
4.05	Foundation class 4W	set	1			0.00	0.00
4.06	Foundation class 5	set	0			0.00	0.00
4.07	Foundation class 5W	set	0			0.00	0.00
4.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
5.00	Complete installation of foundations for tower type: angle tension tower 400DE (60° to 90° angle) Including complete materials, all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works						
5.01	Foundation class 1	set	0			0.00	0.00
5.02	Foundation class 2	set	0			0.00	0.00
5.03	Foundation class 3	set	0			0.00	0.00
5.04	Foundation class 4	set	0			0.00	0.00
5.05	Foundation class 4W	set	0			0.00	0.00
5.06	Foundation class 5	set	0			0.00	0.00
5.07	Foundation class 5W	set	0			0.00	0.00
5.08	Foundation class 6	set	0			0.00	0.00
	SUB-TOTAL					0.00	0.00
6.00	Complete installation of foundations for tower type: terminal tension tower 400DET (0° to 45° angle) Including complete materials, all necessary transport to site, excavation, installation and backfill and all other works and equipment necessary for the construction of foundations as defined in the Scope of Works						
6.01	Foundation class 1	set	0			0.00	0.00

6.02	Foundation class 2	set	0			0.00	0.00
6.03	Foundation class 3	set	1			0.00	0.00
6.04	Foundation class 4	set	1			0.00	0.00
6.05	Foundation class 4W	set	0			0.00	0.00
6.06	Foundation class 5	set	0			0.00	0.00
6.07	Foundation class 5W	set	0			0.00	0.00
6.08	Foundation class 6	set	0			0.00	0.00
SUB-TOTAL						0.00	0.00
7.00	400kV Twin Bundled Conductor DC TowersComplete installation of suspension tower 400DA (0° to 2° angle) as defined in the Scope of Works Erection of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections and measuring of earth resistance and submittance of record to Employer/ Engineer, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings. Securing against vandalism by punching of bolts for leg extensions and first tower section. Note: design of special tower must consider all circumstances specified as per Employer Requirements						
7.01	Type 400DA Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	31			0.00	0.00
7.02	Type 400DA Tower 3,0 m Body Extension (only)	each	12			0.00	0.00
7.03	Type 400DA Tower 6,0 m Body Extension (only)	each	2			0.00	0.00
7.04	Type 400DA Tower 9,0 m Body Extension (only)	each	2			0.00	0.00
7.05	Type 400DA Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
7.06	Type 400DA Tower 15,0 m Body Extension (only)	each	0			0.00	0.00
7.07	Type 400DA Tower 1,0 m Leg Extension	each	31			0.00	0.00
7.08	Type 400DA Tower 2,0 m Leg Extension	each	25			0.00	0.00
7.09	Type 400DA Tower 3,0 m Leg Extension	each	12			0.00	0.00
7.10	Type 400DA Tower 4,0 m Leg Extension	each	4			0.00	0.00
7.11	Type 400DA Tower 5,0 m Leg Extension	each	4			0.00	0.00
7.12	Stubs for Type 400DA tower	each	124			0.00	0.00
SUB-TOTAL						0.00	0.00
8.00	Complete installation of angle/anti-cascading tension tower, 400DB (0° to 10° angle) as defined in the Scope of Works Erection of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections and measuring of earth resistance and submittance of record to Employer/ Engineer, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings. Securing against vandalism by punching of bolts for leg extensions and first tower section. Note: design of special tower must consider all circumstances specified as per Employer Requirements						
8.01	Type 400DB Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	1			0.00	0.00
8.02	Type 400DB Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
8.03	Type 400DB Tower 6,0 m Body Extension (only)	each	0			0.00	0.00
8.04	Type 400DB Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
8.05	Type 400DB Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
8.06	Type 400DB Tower 15,0 m Body Extension (only)	each	0			0.00	0.00
8.07	Type 400DB Tower 1,0 m Leg Extension	each	1			0.00	0.00
8.08	Type 400DB Tower 2,0 m Leg Extension	each	1			0.00	0.00
8.09	Type 400DB Tower 3,0 m Leg Extension	each	1			0.00	0.00
8.10	Type 400DB Tower 4,0 m Leg Extension	each	0			0.00	0.00
8.11	Type 400DB Tower 5,0 m Leg Extension	each	0			0.00	0.00
8.12	Stubs for Type 400DB tower	each	4			0.00	0.00
SUB-TOTAL						0.00	0.00

9.00	Complete delivery and installation of angle tension tower 400DC (10° to 30° angle) as defined in the Scope of Works Erection of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections and measuring of earth resistance and submittance of record to Employer/ Engineer, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings. Securing against vandalism by punching of bolts for leg extensions and first tower section. Note: design of special tower must consider all circumstances specified as per Employer Requirements						
9.01	Type 400DC Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	4			0.00	0.00
9.02	Type 400DC Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
9.03	Type 400DC Tower 6,0 m Body Extension (only)	each	1			0.00	0.00
9.04	Type 400DC Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
9.05	Type 400DC Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
9.06	Type 400DC Tower 15,0 m Body Extension (only)	each	0			0.00	0.00
9.07	Type 400DC Tower 1,0 m Leg Extension	each	4			0.00	0.00
9.08	Type 400DC Tower 2,0 m Leg Extension	each	3			0.00	0.00
9.09	Type 400DC Tower 3,0 m Leg Extension	each	2			0.00	0.00
9.10	Type 400DC Tower 4,0 m Leg Extension	each	0			0.00	0.00
9.11	Type 400DC Tower 5,0 m Leg Extension	each	0			0.00	0.00
9.11	Stubs for Type 400DC tower	each	16			0.00	0.00
	SUB-TOTAL					0.00	0.00
10.00	Complete delivery and installation of angle tension tower 400DD (30° to 60° angle) as defined in the Scope of Works Erection of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections and measuring of earth resistance and submittance of record to Employer/ Engineer, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings. Securing against vandalism by punching of bolts for leg extensions and first tower section. Note: design of special tower must consider all circumstances specified as per Employer Requirements						
10.01	Type 400DD Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	1			0.00	0.00
10.02	Type 400DD Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
10.03	Type 400DD Tower 6,0 m Body Extension (only)	each	0			0.00	0.00
10.04	Type 400DD Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
10.05	Type 400DD Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
10.06	Type 400DD Tower 1,0 m Leg Extension	each	1			0.00	0.00
10.07	Type 400DD Tower 2,0 m Leg Extension	each	1			0.00	0.00
10.08	Type 400DD Tower 3,0 m Leg Extension	each	1			0.00	0.00
10.09	Type 400DD Tower 4,0 m Leg Extension	each	0			0.00	0.00
10.10	Type 400DD Tower 5,0 m Leg Extension	each	0			0.00	0.00
10.11	Stubs for Type 400DD tower	each	4			0.00	0.00
	SUB-TOTAL					0.00	0.00
11.00	Complete delivery and installation of angle tension tower 400DE (60° to 90° angle) as defined in the Scope of Works Erection of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections and measuring of earth resistance and submittance of record to Employer/ Engineer, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings. Securing against vandalism by punching of bolts for leg extensions and first tower section. Note: design of special tower must consider all circumstances specified as per Employer Requirements						
11.01	Type 400DE Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	0			0.00	0.00
11.02	Type 400DE Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
11.03	Type 400DE Tower 6,0 m Body Extension (only)	each	0			0.00	0.00

11.04	Type 400DE Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
11.05	Type 400DE Tower 12,0 m Body Extension (only)	each	0			0.00	0.00
11.06	Type 400DE Tower 1,0 m Leg Extension	each	0			0.00	0.00
11.07	Type 400DE Tower 2,0 m Leg Extension	each	0			0.00	0.00
11.08	Type 400DE Tower 3,0 m Leg Extension	each	0			0.00	0.00
11.09	Type 400DE Tower 4,0 m Leg Extension	each	0			0.00	0.00
11.10	Type 400DE Tower 5,0 m Leg Extension	each	0			0.00	0.00
11.11	Stubs for Type 400DE tower	each	0			0.00	0.00
SUB-TOTAL						0.00	0.00
12.00	Complete delivery and installation of terminal tension tower 400DET (0° to 45° angle) as defined in the Scope of Works Erection of hot dip galvanised lattice steel towers according to the design including stubs, stub extensions, leg extensions, earthing connections and measuring of earth resistance and submittance of record to Employer/ Engineer, warning and danger plates, bird guard protections, number plates, phase plates, circuit plates, aerial plates, step bolts, all necessary fittings, and all connections to the insulator strings. Securing against vandalism by punching of bolts for leg extensions and first tower section. Note: design of special tower must consider all circumstances specified as per Employer Requirements						
12.01	Type 400DET Tower Basic body and crossarms ± 0 m body extension + 0 m leg extensions	per tower	2			0.00	0.00
12.02	Type 400DET Tower 3,0 m Body Extension (only)	each	0			0.00	0.00
12.03	Type 400DET Tower 6,0 m Body Extension (only)	each	0			0.00	0.00
12.04	Type 400DET Tower 9,0 m Body Extension (only)	each	0			0.00	0.00
12.05	Type 400DET Tower 1,0 m Leg Extension	each	2			0.00	0.00
12.06	Type 400DET Tower 2,0 m Leg Extension	each	2			0.00	0.00
12.07	Type 400DET Tower 3,0 m Leg Extension	each	1			0.00	0.00
12.08	Type 400DET Tower 4,0 m Leg Extension	each	0			0.00	0.00
12.09	Type 400DET Tower 5,0 m Leg Extension	each	0			0.00	0.00
12.10	Stubs for Type 400DET tower	each	8			0.00	0.00
SUB-TOTAL						0.00	0.00
13.00	TOWER LOAD TESTS AND FAT Tower Factory Acceptance Test (FAT) and Type test to ultimate loading including, supply, erection and dismantling. The test shall include a minimum of 6 (six) combination of loading cases, the testing station shall be accredited internationally to be used for tower test and all cost for Employer's inspector during test shall be as per Employer's Requirements.						
13.01	Tower type 400DA	Lot	1			0.00	0.00
13.02	Tower type 400DB	Lot	1			0.00	0.00
13.03	Tower type 400DC	Lot	1			0.00	0.00
13.04	Tower type 400DD	Lot	1			0.00	0.00
13.05	Tower type 400DE	Lot	0			0.00	0.00
13.06	Tower type 400DET	Lot	1			0.00	0.00
SUB-TOTAL						0.00	0.00
14.00	Earthing 400 kV Double circuit OHTL Installation Works - tower groundings including excavation, laying of counterpoise, connection to towers including all clamps and other connections, corrosion protection, backfilling, compaction and measuring of ohmic value. The protection against corrosion of chemical attack to the earthing systems shall be taken into consideration as specified Employer Requirements Sections VII.						
14.01	Installation of counterpoise conductor over the first 1.5 km, or 5 spans, whichever is longer, of the line route out of any substation, all towers, including the terminal tower, shall be connected together by continuous counterpoise cable, which also shall be connected to the substation earthing grid including CCS40 copper clad steel wire strand 7 No.7 AWG, bolted tower connector clamp, C-tap compression connectors as specified in Employers Requirements.	km	1.5				
14.02	Installation of Supply of material for Earthing Type A, as specified in Employers Requirements.	each	39			0.00	0.00
14.03	Installation of Supply of material for Earthing Type B, as specified in Employers Requirements.	each	27			0.00	0.00

14.04	Installation of Supply of material for Earthing Type C, as specified in Employers Requirements.	each	8			0.00	0.00
14.05	Installation of Earthing enhancements for Type D where required as per specification to achieve specified tower footing resistance	each	4			0.00	0.00
	SUB-TOTAL					0.00	0.00
15.00	Insulator and Fittings 400 kV Double circuit OHTLINE CONDUCTOR INSULATORS AND FITTINGS Installation of Complete Insulator Sets including insulators, all types of clamps, armour rods, extension links, pilot insulator sets, counterweights and all connections to Tower. All cost for Employer's inspector during test shall be covered as per Schedule of Guarantee Characteristics. NOTE; Arcing horns shall be suitable/adjusted for the operating voltage 330kV, about 2km out from Nakonde Stepdown substation.						
15.01	Single Suspension insulator set for twin "Bluejay" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends	each	162			0.00	0.00
15.02	Double Suspension insulator set for twin "Bluejay" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends.	each	24			0.00	0.00
15.03	Double Tension insulator set for twin "Bluejay" conductor including all clamps and fittings, armour rods and connections to tower, arcing rings both ends	each	96			0.00	0.00
15.04	Twin spacer damper for "Bluejay" conductor bundle	each	1404			0.00	0.00
15.05	Counter weights for reduction of insulator swing	each	12			0.00	0.00
15.06	Factory acceptance tests (FAT) for Insulators as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
15.07	Factory acceptance tests (FAT) Fittings and Accessories for Insulator as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
15.08	Test for arcing horn as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
15.09	Type Test for Insulator Strings as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
	SUB-TOTAL					0.00	0.00
15.10	Fall Arrest System	set	5			0.00	0.00
	SUB-TOTAL					0.00	0.00
16.00	CONDUCTOR , OPGW AND GROUND WIRE Supply, stringing and installation including all joints, sleeves, jumper loops, spacers and necessary dampers, earthing connections and all downloads as per Employers Requirements. All cost for Employer's inspector during test shall be covered as per Employers Requirements						
16.01	ACSR Conductor code name Bluejay; twin bundled, stringing of double circuit	route km	15			0.00	0.00
16.02	Optical Ground Wire (OPGW) type ACSR 95/55, 48 cores (24+24), ITU-T G.655 and ITU-T G.652D s/c rating 200 kA2/sec, including all splicing and connections to joint boxes.	route km	15			0.00	0.00
16.03	Earth Wire (OHGW) type ACSR 95/55	route km	15			0.00	0.00
16.04	Stockbridge type vibration dampers for Bluejay conductor	each	1128			0.00	0.00
16.05	Stockbridge type vibration dampers for OPGW type ACSR 95/55	each	153			0.00	0.00
16.06	Stockbridge type vibration dampers for Earth Wire type ACSR 95/55	each	94			0.00	0.00
16.07	Mid - span tension joint for Bluejay conductor	each	93			0.00	0.00
16.08	Mid - span tension joint for Earth Wire OHGW type ACSR 95/55	each	4			0.00	0.00
16.09	Repair sleeve for Bluejay conductor	each	9			0.00	0.00
16.10	Type test, Conductors as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
16.11	Type test , OPGW as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
16.12	Type test, OHGW conductors as per Employer Requirement section VII Part II	Lot	1			0.00	0.00
16.13	Factory acceptance tests (FAT), Conductor test as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
16.14	Factory acceptance tests (FAT), OPGW test as per Employer Requirement; Section VII, Part II	Lot	1			0.00	0.00
16.15	Factory acceptance tests (FAT), Earth wire (OHGW) test as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
16.16	Factory acceptance tests (FAT), for space damper as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00
16.17	Factory acceptance tests (FAT), for vibration damper as per Employer Requirement, Section VII, Part II	Lot	1			0.00	0.00

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)			
SCHEDULE: No. 5 Grand Summary			
Item	Description	Total Price ¹	
		Foreign [Specify Currency]	Local (ZMW)
¹ Specify currency in accordance with requirements stipulated in Bid Data Sheet under ITB 18.1 & 18.2.			
	Total Schedule No. 1. Plant, and Mandatory Spare Parts Supplied from Abroad	0.00	
	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Within the Employer’s Country	0.00	0.00
	Total Schedule No. 3. Design Services	0.00	0.00
	Total Schedule No. 4. Installation and Other Services	0.00	0.00
	Total	0.00	0.00
		Name of Bidder _____	
		Signature of Bidder _____	

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

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¹ Bidders shall enter a code representing the country of origin of all imported plant and equipment.

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies.

¹Bidders shall enter a code representing the country of origin of all imported plant and equipment.

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies

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400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)				
SCHEDULE No. 7 - Dayworks Rates (Not for Evaluation)				
7.0	DAYWORK RATES	QTY	UOM	UNIT RATE
7.1	Prices for miscellaneous steel work, prices for special towers, special extensions and modifications (inclusive of design)			
7,1,1	Structural high yield steel	1	tonne	
7,1,2	Structural mild steel	1	tonne	
7.2	Miscellaneous prices for foundation work inclusive of design			
7,2,1	Special foundation work including pile caps, beams and modifications to normal foundations to adapt specified foundation classes to cater for particular soil conditions.			
7,2,1,1	Lean concrete (grade C12/15), including formwork	1	cubic m.	
7,2,1,2	Reinforced concrete (grade C30/37), including formwork	1	cubic m.	
7,2,1,3	Excavation in normal soils (including reinstatement)	1	cubic m.	
7,2,1,2	Excavation in hard rock, excluding class 1 foundations (including reinstatement)	1	cubic m.	
7,2,1,5	Steel reinforcement bars including supply, bending and placing	1	tonne	
7,2,1,6	Imported backfill	1	cubic m.	
7,2,1,7	Rip-rap stone work, 0.5m deep over tower base area to protect against erosion	1	square meter	
7,2,1,8	1m x 1m x 2m rock filled gabion baskets, installed, to protect foundations against erosion	1	linear m.	
7.3	Transmission Line Diversions: Complete profile survey and setting out of a diversion to the original line route including preparation of profiles and drawings, including complete ground line and conductor clearance checks, selection of tower types, pegging of tower positions, preparation of diagonal profiles including sub-soil investigations.	1	Route km	
7.4	Transmission Line Diversions: Route clearance and construction of all required access and maintenance roads	1	Route km	
7.5	Galvanized steel gates to be installed where access routes cross fenced property boundaries	1	Lot	
7.6	200mm wearing coarse layer to be installed on access roads	1	km	
7.7	Cost of earthing metallic roofs of buildings	1	per building	
7.8	Cost of earthing metallic fences	1	per connection	
7.9	Special Foundations Rates (Not classified under foundation classes 1 - 6)			
7.9.1	Additional depth concrete (m ³)	1	(m ³)	
7.9.2	Rock excavation (m ³)	1	(m ³)	
7.9.3	Micro-piles (m)	1	m	
7.9.4	Soil improvement (m ³)	1	(m ³)	
7.9.5	Dewatering (LS per location)	1	LS per location	
7.9.6	Re-spotting (each)	1	each	
	Name of Bidder			
	Signature of Bidder			

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Grand 132kV Nakonde-Isoka, 330kV Kasama-Nakonde and 400kV Nakonde-Tanzania Border	Summary

132kV Nakonde - Isoka Line Loop-In - Loop-Out Double-Circuit Overhead Transmission Line (NI)									
To	be	filled	in	from	SCHEDULE:	No.	5	Grand	Summary
132kV Nakonde - Isoka Line Loop-In - Loop-Out Double-Circuit Overhead Transmission Line (NI)									
Item	Description					Total Price ¹			
						Foreign [Specify Currency]		Local (ZMW)	
¹ Specify currency in accordance with requirements stipulated in Bid Data Sheet under ITB 18.1 & 18.2.									
	Total Schedule No. 1. Plant, and Mandatory Spare Parts Supplied from Abroad								
	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country								
	Total Schedule No. 3. Design Services								
	Total Schedule No. 4. Installation and Other Services								
	Total					0.00		0.00	
						Name of Bidder _____ Signature of Bidder _____			

330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)									
To	be	filled	in	from	SCHEDULE:	No.	5	Grand	Summary
330kV Kasama-Nakonde Stepdown Double-Circuit Overhead Transmission Line (KN)									
Item	Description					Total Price ¹			
						Foreign [Specify Currency]		Local (ZMW)	
¹ Specify currency in accordance with requirements stipulated in Bid Data Sheet under ITB 18.1 & 18.2.									
	Total Schedule No. 1. Plant, and Mandatory Spare Parts Supplied from Abroad								
	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country								
	Total Schedule No. 3. Design Services								
	Total Schedule No. 4. Installation and Other Services								
	Total					0.00		0.00	
						Name of Bidder _____ Signature of Bidder _____			

400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)									
To	be	filled	in	from	SCHEDULE:	No.	5	Grand	Summary
400kV Nakonde-Tanzania border Double-Circuit Overhead Transmission Line (NT)									
Item	Description					Total Price ¹			
						Foreign [Specify Currency]		Local (ZMW)	
¹ Specify currency in accordance with requirements stipulated in Bid Data Sheet under ITB 18.1 & 18.2.									
	Total Schedule No. 1. Plant, and Mandatory Spare Parts Supplied from Abroad								

	Total Schedule No. 2. Plant, and Mandatory Spare Parts Supplied from Within the Employer’s Country		
	Total Schedule No. 3. Design Services		
	Total Schedule No. 4. Installation and Other Services		
	Total	0.00	0.00
		Name of Bidder _____	
		Signature of Bidder _____	

Package 3 - 132kV, 330kV and 400kV Overhead Transmission Lines - Grand Total Summary		
¹ Specify currency in accordance with requirements stipulated in Bid Data Sheet under ITB 18.1 & 18.2.	Total Price ¹	
	Foreign [Specify Currency]	Local (ZMW)
TOTAL Bid Price (To Letter of Bid) :	0.00	0.00
	Name of Bidder _____	
	Signature of Bidder _____	

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

Price Adjustment

If price adjustment applies in accordance with ITB 17.9, the Bidder shall indicate the sources of indices and source of exchange rate (if applicable) and the base date indices in its Bid.

Item	Source of Indices	Base date Indices	Source of exchange rate (if applicable)

Index values should correspond to the Price Adjustment formula in Appendix 2 – Price Adjustment to the Contract Agreement.

Bidders should not modify the Price Adjustment formula, the list of coefficients, or their weightings as set out in Appendix 2; only the sources of indices and base indices may be proposed in this form.

The material and equipment indices may consist of several components, however for this contract the following material shall be comprised without alteration: **Cement, Aggregate, Aluminium, Steel, Reinforcing Steel, Steel Structure, Fuel.**

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Section V – Eligible Countries

Eligibility for the Provision of Goods, Works and Non-Consulting Services in Bank-Financed Procurement

In reference to ITB 4.8 and 5.1, for the information of the Bidders, at the present time firms, goods and services from the following countries are excluded from this Bidding process:

Under ITB 4.8 (a) and 5.1: **None**

Under ITB 4.8 (b) and 5.1: **None**

Section VI – Fraud and Corruption

1. Purpose

The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.1 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders (applicants/ proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.2 To this end, the Bank:

- a. Defines, for the purposes of this provision, the terms set forth below as follows:
 - i. "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;
 - ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;
 - iii. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;
 - iv. "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;
 - v. "obstructive practice" is:
 - (a) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
 - (b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.
- b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;
- c. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement process, selection and/or execution of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- d. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;¹⁰ (ii) to be a nominated¹¹ sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;
- e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders (applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents, personnel, permit the Bank to inspect¹² all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

¹⁰ For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

¹¹ A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

¹² Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

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PART 2 - Employer’s Requirements – Transmission Lines

Section VII - Employer’s Requirements

1 SCOPE OF SUPPLY OF PLANT AND INSTALLATION SERVICES BY THE CONTRACTOR

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Acronyms and Abbreviations

Acronym	Explanation
AAAC	All Aluminium Alloy Conductor
ABC	Aerial Bundled Cable
AC	Alternating Current
ACSR	Aluminium Conductor Steel Reinforced
ACSS	Aluminium Conductor Steel Supported
ADSS	All Dielectric Self-Supporting (Fibre Optic Cable)
AR	Auto-recloser
BCU	Bay Control Unit
BMP	Biodiversity Management Plan
BS	British Standards
CB	Circuit Breaker
CCTV	Closed-Circuit television
CEE	Commission Electrical Equipment
CENELEC	Comité Européen de Normalisation Electrotechnique
CT	Current Transformer
CVT	Capacitor Voltage Transformer
DC	Direct Current
DCC	Distribution Control Centre
DIN	Deutsche Industrie Norm
DMS	Distribution Management System
DS	Disconnecting Switch
DSL	Switch Load Disconnecter
DSS	Distribution Substation
DT	Distribution Transformer
EF	Earth Fault
EMC	Electromagnetic Compatibility
EMS	Energy Management System
ES	Earthing Switch
ESIA	Environmental and Social Impact Assessment
FAT	Factory Acceptance Test
FO	Fibre Optical
GCC	Grid Control Centre
GIS	Gas Insulated Substation, (also: Geographic Information System)
GMT	Ground Mounted Transformer Station
GPS	Global Positioning System
GW	Ground Wire
HMI	Human Machine Interface
HV	High Voltage
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
IM	Interface Modules
k	kilo = thousand
km	kilometre
kV	kilo Volt
kVA	kilo Volt Ampere
kVAr	kilo Volt Ampere reactive
kVArh	kilo Volt Amperes reactive hours, unit of reactive energy consumption
kW	kilo Watt
kWh	kilo Watt hour, unit of active energy consumption
LAN	Local Area Network
LV	Low Voltage (0.4kV)
M	Mega = million
masl	meters above sea level

Acronym	Explanation
MCB	Miniature Circuit Breaker
MCCB	Moulded Case Circuit Breaker
MoE	Ministry of Energy
ms	Millisecond, 1/1000 s
MUX	Multiplexer
MV	Medium Voltage (33kV, 11kV, etc)
MVA	Mega Volt Ampere = 1000kVA
MVAr	Mega Volt Ampere Reactive
MW	Mega Watt = 1000 kW
MWh	Mega Watt hour = 1000 kWh
NHCC	National Heritage Conservation Commission (archaeology, culture)
O&M	Operation and Maintenance
ODF	Optical Distribution Frame
OH	Overhead
OHL	Overhead Line
OHTL	Overhead Transmission Line
OLTC	On Load Tap Changer
ONAF	Oil immersed forced-cooled transformer (Oil=Natural, Air=Forced)
ONAN	Oil immersed self-cooled transformer (Oil=Natural, Air=Natural)
OPGW	Ground wire with optical fibres
P/S	Power station
PABX	Substation’s telephone system
PCB	Poly Chlorinated Biphenyl (chemical compound)
PE	Polyethylene plastic
PEN	Protective Earth/Neutral (conductor)
PLC	Programmable Logic Controller
PMT	Pole Mounted Transformer Station
PPE	Personal Protection Equipment (e.g. boots, gloves, helmet, earmuffs)
QA	Quality Assurance
r.m.s.	RMS = Root Mean Square. The RMS or effective value of a sinusoidal waveform gives the same heating effect of an equivalent DC supply
RTU	Remote Terminal Unit
S/S	Substation
SAPP	Southern Africa Power Pool
SCADA	Supervisory Control and Data Acquisition
SCU	Station Control Unit
SLD	Single Line Diagram, a.k.a. 1L diagram
SOE	Sequence of Events
Tan delta test	A Tan delta test, a.k.a. Loss Angle or Dissipation Factor testing, is done in transformers to measure the insulation quality of transformer oil
TANESCO	Tanzania Electric Supply Company Ltd
TOV	Temporary Over-Voltage
UG	Underground
UPS	Uninterrupted Power Supply
VDE	Verband Deutscher Elektrotechniker
VDU	Visual Display Unit
VT	Voltage Transformer
XLPE	Cross-linked polyethylene plastic

2 CONSTRUCTION OF DOUBLE-CIRCUIT 400kV, 330kV AND 132kV TRANSMISSION LINES

This project is part of the overall Zambia – Tanzania Interconnector Project (ZTIP) and is part of Phase 2 of the Zambian portion of the ZTIP, which are divided in five (5) packages as described below.

- Package 1 and Package 2 includes the construction of single circuit 330 kV transmission lines from Pensulo substation through Mpika substation, to Kasama substation.
- Package 4 includes the completely new 330kV Nakonde Stepdown Substation (S/S), and extension of Kasama 330/132(66)kV S/S with two 330kV line bays.
- Package 5 includes the required Dynamic Voltage Support Device’s (DVSD’s) in 330kV Nakonde Stepdown S/S and Pensulo S/S.

This request for bids relates to Package 3, which includes the design, supply, installation, testing and commissioning of the following transmission lines:

- 1) 400kV double-circuit OHL 330kV Nakonde Stepdown S/S – Tanzania border (to be operated at 330kV), 15km length.
- 2) 330kV double-circuit OHL Kasama S/S – Nakonde Stepdown S/S, 212km length, and
- 3) 132kV double-circuit Nakonde Stepdown S/S – Loop-in/Loop-out on the existing 66kV line between Isoka and Nakonde Town 66kV substations, 13km length.

The Package 3 Project is located in Muchinga province and Northern province.

2.1 Description of the Package 3 Transmission Lines

2.1.1 400kV double-circuit OHTL Nakonde Stepdown S/S – Tanzania border

The double circuit 400kV line is to comprise two (2) Bluejay conductors per phase, one (1) ACSR 95/55 shield wire and one (1) optical ground wire (OPGW) similar to ACSR 95/55.¹³

The line is to take off from the new 330kV Nakonde Stepdown substation and continue north to the border with Tanzania. The line will be connected to the corresponding line on Tanzanian side as described further below. The estimated distance for the 400kV transmission line is approximately 15km. The 400kV line will be operated on 330kV, hence the OHTL arcing horns have to be suitable for 330kV for the first 2km from the Nakonde substation.

The bidder shall prioritise works on this corridor to align with the substation works and be ready for connection to the Nakonde substation.

2.1.2 330kV double-circuit OHTL Kasama S/S – Nakonde Stepdown S/S

The double circuit 330kV line is to comprise two (2) Bison conductors per phase, one (1) aluminium clad steel (ACS 7/6 AWG) shield wire and one (1) optical ground wire (OPGW).

The line is to take off from the Kasama 330kV substation and continue north-east and connect to the 330kV Nakonde Stepdown substation.

The estimated distance for the 330kV transmission line is approximately 212km.

2.1.3 132kV double-circuit OHTL Nakonde Stepdown S/S – Loop-In/Loop-Out on Isoka – Nakonde town 66kV line

The double circuit 132kV line is to comprise one (1) Wolf conductor per phase, and one (1) optical ground wire (OPGW).

The estimated distance for the 132kV transmission line is approximately 13km.

The line is to take off from the 330kV Nakonde Stepdown S/S and continue east to make a Loop-In - Loop-Out arrangement of the existing 66kV single-circuit line between Isoka and Nakonde Town 66kV substations, as well as a Loop-in/Loop-out arrangement for the OPGW at the nearest existing dome joint about 2 km south of the 132kV T/end tower. The 132kV line shall initially be operated at 66kV. No temporary reduction of arcing horn/ring gaps or alterations to the insulator strings shall be made for the initial period. All performance guarantees (RIV, corona inception, withstand / impulse levels) shall be met for the 132 kV design and are deemed sufficient during 66 kV operation. All 66 kV-specific requirements shall be confined to the LI/LO interfaces (jumpers, terminals, and conductor/OPGW tie-ins) and coordinated with the existing 66 kV lines.

The bidder shall similarly prioritise works on this corridor to align with the substation works and be ready for connection to the Nakonde substation.

The loop-in/loop-out of the OPGW will involve establishing a 2.5 route km ADSS cable on wooden poles to the nearest dome joint on the existing 66kV line,

The Contractor shall study the following option and present a solution.

Option: The loop-in/loop-out of the OPGW can be achieved by stringing the OPGW on the existing 66kV steel towers to the same dome joint, if the structural requirements can be satisfactory confirmed by the Contractor. This option shall be priced in Price Schedule 1 and Schedule 4. The Employer will evaluate bids based on the sum of the base price and the priced option.

2.1.4 Line Design Parameters Summary

To ensure consistency, the following table summarizes key design parameters for all lines, aligned with EN 50341 (**Level 1 reliability, 50-year return period**) and IEC standards. Climate basis: wind 3s gust 36 m/s at 10m height ($q_0=800$ Pa), max temp +45°C, **min -1°C**, seismic MMI VI-VII per EN 1998. Altitude corrections per IEC 60071-2 ($K_a=1.08$ at 1,600 masl for 330/132kV; 1.16 at 2,200 masl for 400kV, segment-wise). Pollution: Heavy (Class d) for 330/132kV; Very Heavy (Class e) for 400kV to align with TANESCO.

¹³¹³ The OPGW shall comply with IEC 60794-4-1: Optical fibre cables – Part 4-1: Aerial optical cables along electrical power lines – OPGW, and shall possess mechanical and electrical characteristics approximately equivalent to ACSR 95/55 overhead earth wire in terms of rated tensile strength, unit weight, and current-carrying capacity.

Parameter	400kV Nakonde-Tanzania Border (Double-Circuit, Operated at 330kV)	330kV Kasama-Nakonde (Double-Circuit)	132kV Nakonde-Isoka/Nakonde Town (Double-Circuit, In/Loop-Out)
Conductor Type	Twin bundled ACSR Bluejay	Twin bundled ACSR Bison	Single ACSR Wolf
Bundle Spacing	45 cm	45 cm	N/A
Shield Wire	One ACSR 95/55 + One OPGW	One ACS 7/6 + OPGW	One ACS 7/6
Estimated Length	~15 km	~212 km	~13 km
Max Conductor Temp	85°C	80°C	75°C
Design Altitude	2,200m	1,600m	1,600m
Insulation/ Pollution Class	Very Heavy (Class e) Ka=1.16	Heavy (Class d) Ka=1.08	Heavy (Class d) Ka=1.08
Short-Circuit Rating	31.5kA/1s (general); 40kA/1s (arcing horns)	Same	Same
Lightning Performance	≤0.7 flashovers/100 km-year	≤1.0 flashovers/100 km-year (CIGRÉ TB 63)	≤1.0 flashovers/100 km-year
Seismic	MMI VI-VII per EN 1998	Same	Same

Note: Bidder should submit guaranteed ampacity for Bluejay (twin bundle) / Bison (Twin bundle) / Wolf (single) at [85/80/75] °C with assumptions (ambient temperature, wind speed, reference altitude, emissivity/absorptivity, solar heat flux) and provide PLS-CADD thermal rating files used to derive these values as part of the GTCs.

2.1.5 Summary of Key Plant Quantities and Specifications

2.1.5.1 Summary of Tower Quantities

Line Package	Tower Type	Basic Body Qty	Body Extensions (m)	Leg Extensions (m)	Stubs Qty	Approx. Total
400kV Nakonde-Tanzania Border, operated at 330kV (15 km)	400DA (Suspension, 0°-2°)	31	3m:12, 6m:2, 9m:2	1m:31, 2m:25, 3m:12, 4m:4, 5m:4	124	31
	400DB (Tension, 0°-10°)	1	None	1m:1, 2m:1, 3m:1	4	1
	400DC (Tension, 10°-30°)	4	None	1m:4, 2m:3, 3m:2	16	4
	400DD (Tension, 30°-60°)	1	None	1m:1, 2m:1, 3m:1	4	1
	400DE (Tension, 60°-90°)	0	None	None	0	0
	400DET (Tension, 0°-45°)	2	None	1m:2, 2m:2, 3m:1	8	2
	Total	-	-	-	-	39
330kV Kasama-Nakonde (212 km)	330DA (Suspension, 0°-2°)	522	3m:66, 6m:13, 9m:5, 12m:1, 15m:1	1m:522, 2m:418, 3m:209, 4m:63, 5m:63	2,088	522
	330DB (Tension, 0°-10°)	37	6m:4, 12m:1	1m:37, 2m:30, 3m:15, 4m:4, 5m:4	148	37
	330DC (Tension, 10°-30°)	7	None	1m:7, 2m:6, 3m:3, 4m:1, 5m:1	28	7
	330DD (Tension, 30°-60°)	11	9m: 1	1m:11, 2m:9, 3m:4, 4m:1, 5m:1	44	11
	330DE (Tension, 60°-90°)	6	9m:1	1m:6, 2m:5, 3m:2, 4m:1, 5m:1	24	6
	330DT (Transposition, 0°-10°)	2	3m:1, 6m:1	1m:2, 2m:2, 3m:1, 4m:1, 5m:1	8	2
	330DET (Terminal, 0°-45°)	2	None	1m:2, 2m:2, 3m:1	8	2
	Total	-	-	-	-	589
132kV Nakonde-Isoka LI-LO, operated at 66kV (13 km)	132DA (Suspension, 0°-2°)	33	3m:20, 6m:3	1m:33, 2m:26, 3m:13, 4m:4, 5m:4	132	33
	132DB (Tension, 0°-30°)	2	None	1m:2, 2m:2, 3m:1	8	2
	132DC (Tension, 30°-60°)	2	None	1m:2, 2m:2, 3m:1	8	2
	132DD (Tension, 60°-90°)	1	None	1m:1, 2m:1	4	1
	132 DET (0° – 45°)	1	None	1m:1, 2m:1	4	1
	132SPEC (Special, 90°+90°)	1	None	1m:1, 2m:1	4	1
	Total	-	-	-	-	39

Notes: Quantities include mandatory spares (e.g., 5x 330DA spares in 330kV). Foundations and installation mirror tower counts (e.g., one set per tower leg).

- Summary of Conductor Specifications from Technical Schedules**

These detail ACSR types used across lines (Bluejay/Bison for higher voltage; Wolf for 132kV). All comply with ASTM B232/EN 50182/BS 215.

Conductor Type	Total Cross-Section (mm²)	Al Area (mm²) / Steel Area (mm²)	Overall Dia. (mm)	Stranding (Al/Steel)	Rated Strength (kN)	DC Resistance (Ω/km @20°C)	Mass (kg/km)	Line Application
ACSR Bluejay	604.39	563.93 / 39.03	31.98	45/7	132.63	0.0501	1868	400kV (330kV) (twin bundle)
ACSR Bison	431.2	381.7 / 49.5	27	54/7	120.9	0.07573	1444	330kV (twin bundle)
ACSR Wolf	194.94	158.06 / 36.88	18.13	30/7	69.2	0.1828	727	132kV (single)
ACSR 95/55	152.8	95 / 55	18	12/7	80.2	0.2992	700	Overhead Ground Wire/ OPGW Reference
ACS 7/6 AWG	93.1	27.8 / 65.3	12.3	7/-	101.1	0.922	619	

Notes: Conductor Includes vibration dampers, spacers, and repair sleeves per type. OPGW mechanical and physical parameters should be similar to ACSR or ACSS used for overhead ground wire (OHGW).

2.2 Location and Access to Site

The works for the overall project are located in Zambia’s Central province (Pensulo works), Muchinga province (Mpika and 330kV Nakonde Stepdown works) and Northern province (Kasama works).

There is limited road and track access along the northern section of the proposed transmission line route (Package 3), however the southern portions of the transmission line (Packages 1 & 2) largely follow existing route corridors.

2.3 Overhead Line Scope of Works

The scope of works shall include the following transmission line components.

- 1) Construction of 330kV self-supporting steel lattice towers double-circuit overhead transmission line from Kasama Substation to Nakonde Stepdown Substation, 212km length. The double circuit will comprise of double-bison conductors, one (1) aluminium clad steel (ACS) shield wire and one (1) optical ground wire (OPGW).
- 2) Construction of a 400kV self-supporting steel lattice towers double-circuit overhead transmission line from Nakonde Stepdown Substation to the Tanzania border (to be operated at 330kV), 15km length. The double circuit 400kV line is to comprise two (2) Bluejay conductors per phase, one (1) ACSR 95/55 shield wire and one (1) optical ground wire (OPGW) similar to ACSR 95/55.¹⁴
- 3) Construction of 132kV self-supporting steel lattice towers, double-circuit overhead sub-transmission line from Nakonde Stepdown Substation to Loop-in/Loop-out on the existing 66kV line between Isoka and Nakonde Town 66kV substations, 13km length. The double-circuit is to comprise one (1) Wolf conductor per phase, and one (1) optical ground wire (OPGW).

The Contract includes:

- Detailed survey and tower spotting, confirmation and acceptance of the overhead line route alignment provided as LiDAR survey and PLS-CADD plan and profiles, tower and foundation selection, foundation pegging;
- Design of the Tower structures, including detailed design and fabrication of lattice steel transmission line towers including all associated body and leg extensions;
- Subsoil investigation and geotechnical analysis for tower foundation design: Design of foundations to suit towers, geotechnical analysis and soil conditions
- Clearing of the right-of-way, including disposal of felled timber and removal of termite hills where they infringe on required clearances, together with construction of all necessary access tracks and preparation of tower sites;
-
- Providing a maintenance road along the line complete with the finger access roads from public roads;
- Supply and delivery of spare materials, special tools and equipment for the maintenance of the overhead transmission line as per Technical Schedule Section 8;
- Tower testing, foundation testing, concrete and grout cube compressive strength tests, foundation and rock anchor pull-out tests, and other tests as required by the Employer.
- Supply of materials, tools and equipment and labour needed for the tests shall be provided by the Contractor;
- All works required to comply with the environmental mitigation measures;
- Preliminary and final soil resistivity measurements and tests;
- Provision for the prevention and control of soil erosion at tower sites where required;
- Supply, delivery to site and erection of all necessary materials to complete the works, including, but not limited to, towers, foundations, conductors, overhead ground wire, optical fibre overhead ground wire, line hardware, optic fibre terminations and junction boxes, insulators, vibration dampers, semi flexible spacers, tower signs, grounding materials and other auxiliary items, including supply and delivery of spare parts;
- Testing and commissioning of completed works;
- Provision of operation and maintenance manuals;
- Any other works required to complete the Overhead Transmission Lines in accordance with the Contract.

The Contractor shall be solely responsible for detailed design, scheduling, coordinating, supply, construction and installation, testing and commissioning of the Works as provided under the Contract.

Notwithstanding that not all details of components and accessories etc. required for the complete installation and satisfactory operation of the Transmission Lines are specifically mentioned in this specification; design and provision of such components and accessories are to be considered as part of the Scope of Work under the Contract and included in the Contract price, unless otherwise specified.

2.4 Additional Information Provided

For Bidding purpose, a transmission line route is provided as coordinates in WGS 84 36S and route map. PLS-CADD Profiles of the routes, with proposed tower positions, is also provided in pdf format. Outline tower designs are provided in pdf format, see below section 14 SUPPLEMENTARY INFORMATION, Appendix 1 and Appendix 2.

A Soil Investigation report including bore hole logs, trial pits and Dynamic Cone Penetration Test (DCPT) results are provided.

The PLS-CADD profiles and Soil Investigation data should be used for reference only. The Employer will accept no liability for the accuracy of the data provided and it will be the Contractor’s sole responsibility to ensure that any of the data used is checked, verified and accepted as the Contractors design prior to its use.

¹⁴ The OPGW shall comply with IEC 60794-4-1: Optical fibre cables – Part 4-1: Aerial optical cables along electrical power lines – OPGW, and shall possess mechanical and electrical characteristics approximately equivalent to ACSR 95/55 overhead earth wire in terms of rated tensile strength, unit weight, and current-carrying capacity.

The Contractor will be required to undertake detailed topographic surveys to locate and set out all tower locations as indicated by the data provided. Confirmation of the alignment as well as the final selection of line route and tower types shall be subject to the approval of the Employer. The ground survey check shall be executed along the selected line route and without departure from it except with the Employer's approval. The Contractor may propose deviations to the selected route or to individual tower positions subject to approval by the Employer. The Contractor will be responsible for ensuring that any such changes are surveyed in detail, PLS-CADD profiles are produced accordingly, and conductor clearances and tower loadings are checked to confirm acceptability. The Contractor should provide final complete PLS-CADD files to the Employer.

2.5 Transmission Line Route

The final survey of the route and the line plan and profile forms a part of the Contractor’s responsibility. The Contractor shall perform all survey work required to establish a true alignment between angle points.

The Employer has provided the coordinates defining the line route in section 11.1. The entire line route has been acquired, and all landowners have been compensated.

If necessary, the Contractor will be required to undertake diversion surveys along the line route, if requested to do so by the Employer, particularly where this may be necessary due to landowner disputes or due to environmental reasons. The Employer shall manage all land acquisition in this regard.

The Contractor shall also provide appropriate slope or tower footing protection including, but not limited to grassing, stone pitching, rip rap, terracing or cribbing, gabions, etc., under the direction of the Employer. Bidders are expected to provide unit prices for implementation of any of the above slope protection or equivalent as may be proposed by the Bid.

Profiling and survey work shall consist of determining and laying out the centreline and elevation of all the reference points based on the key maps and plans, together with side slopes across the right-of-way. The Contractor shall determine individual tower setting levels, tower body and leg extensions and extensions to foundations as required to minimise the need for benching while ensuring the minimum clearance of conductors crossing existing roads, railways, waterways, telecommunication lines, power lines, buildings and any other obstruction along the right-of-way are maintained.

The Contractor will be required to undertake sufficient geotechnical investigation, including boreholes, water table level measurement, SPT’s and DCPT’s to ensure a robust selection process for the type of tower foundation to be installed at each tower location is undertaken prior to excavation. The foundation type to be installed shall be monitored during and on completion of excavation, with final selection of foundation type agreed with the employer prior to concreting.

Encroaching or adjoining features such as villages, buildings, roads, railways, streams, fences, pipelines, power lines, etc. shall be identified and mapped.

The survey shall include a side clearance survey to ensure that the minimum specified clearance to ground and any adjacent object or structure is adhered to under conductor swing due to wind.

2.6 Terminal points for the overhead line

The terminal points are defined as follows:

- a) The download connections of conductors, OPGW and earth wire, from the terminal towers to the substation gantry structures at both ends of the line, the droppers required to connect to the substation equipment and the connection itself, are included in this Scope of Works. The gantry structures and their foundations shall be the responsibility of the substation contractor (Package 4)
- b) OPGW earth wire downloads will be terminated in a junction box capable of accommodating an underground fibre optical cable connection to be mounted on the substation/CSE gantries. Connections from the junction boxes towards the substations optical distribution rack (ODR) are included.

2.6.1 Description of the 400kV double-circuit OHTL, 330kV Nakonde Stepdown S/S – Tanzania border,

The terminal points are defined as follows:

- a) The download connections of conductors, OPGW and earth wire, from the terminal tower to the 330kV Nakonde Stepdown S/S gantry structure, the droppers required to connect to the substation equipment and the connection itself, are included in this Scope of Works. The gantry structures and their foundations shall be the responsibility of the Substation Contractor (Package 4)
- b) **This Package 3 Contractor shall string the last span(s) up to and including the border crossing on both phase conductors and shield wires / OPGW, and should coordinate with TANESCO for joint inspection, testing, and commissioning/acceptance activities.** Any pre-requisites for outages, permits, and access on the Tanzania side will be organized by ZESCO. **The Border Crossing span and connection works will be a separate item in BoQ, see e) below.**
- c) **The Contractor shall provide OPGW dome joints and splice at the border crossing and all phase conductor jumpers and insulators including all connections and should coordinate with TANESCO for joint inspection, testing, and commissioning/acceptance activities.** The contractor shall provide a detailed method statement addressing roles, access, safety, communications, and acceptance records.
- d) OPGW earth wire downloads will be terminated in a junction box capable of accommodating an underground fibre optical cable connection to be mounted on the substation/CSE gantries. Connections from the junction boxes towards the substations optical distribution rack (ODR) are included.
- e) **The bidder shall be deemed to have included in his pricing, the final stringing of the 400m span across the border with all conductors, accessories and fittings.**

2.6.2 Description of the 330kV double-circuit OHTL Kasama S/S – 330kV Nakonde Stepdown S/S

The terminal points are defined as follows:

- a) The download connections of conductors, OPGW and earth wire, from the terminal towers to the substation gantry structures at both ends of the line, the droppers required to connect to the substation equipment and the connection itself, are included in this Scope of Works. The gantry structures and their foundations shall be the responsibility of the Substation Contractor (Package 4)
- b) OPGW earth wire downloads will be terminated in a junction box (to be supplied by substation contractor) capable of accommodating an underground fibre optical cable connection to be mounted on the substation/CSE gantries. Connections from the junction boxes towards the

substations optical distribution rack (ODR) are included. The works of the transmission line contractor includes testing of the optical connection within the OPGW prior connection of the fibre optical connection cable (ADSS) to the telecommunication equipment.

2.6.3 Description of the 132kV double-circuit OHTL 330kV Nakonde Stepdown S/S – Loop-In/Loop-Out on the Isoka - Nakonde town 66kV line

The double circuit 132kV line is to comprise one (1) conductor per phase, and one (1) optical ground wire (OPGW). The line is to take off from the proposed 330kV Nakonde Stepdown substation and continue east to make a Loop-in/Loop-out arrangement of the existing 66kV line between Isoka and Nakonde Town 66kV substations.

One 132(66)kV circuit will be connected to Isoka substation, and the other 132(66)kV circuit will be connected to Nakonde Town 66kV substation. **No temporary reduction of arcing horn/ring gaps or alterations to the insulator strings shall be made for the initial period.** All performance guarantees (RIV, corona inception, withstand / impulse levels) shall be met for the 132 kV design and are deemed sufficient during 66 kV operation. All 66 kV-specific requirements shall be confined to the LI/LO interfaces (jumpers, terminals, and conductor/OPGW tie-ins) and coordinated with the existing 66 kV lines.

The OPGW terminal point is defined as follows:

- The download connections of conductors, OPGW and earth wire, from the terminal tower to the Nakonde Stepdown substation 132kV gantry structure, the droppers required to connect to the substation equipment and the connection itself, are included in this Scope of Works. The gantry structures and their foundations shall be the responsibility of the Substation Contractor (Package 4)
- Connection to 66kV Nakonde - Isoka line
- The OPGW is equipped with 48 fibres, where 24 fibres shall be linked to Isoka 66kV substation, and 24 fibres shall be linked to the existing Nakonde 66kV substation. At the substation the OPGW earth wire downloads will be terminated in a junction box capable of accommodating an underground fibre optical cable connection to be mounted on the substation/CSE gantries. Connections from the junction boxes towards the substations optical distribution rack (ODR) shall be included.

At the T-junction (Tower KIN42 in Figure 1 below) to the existing 66kV line, a joint box shall be installed and connect to a new ADSS cable (48 fibres) with an approximate length of 2km using the existing right of way. The ADSS cable shall be mounted on wooden poles to connect at an existing joint box on the existing OPGW mounted on the 66kV line, see Figure 1 below. A suitable joint box (48 fibres) shall be supplied for this purpose.

Option: The loop-in/loop-out of the OPGW can be achieved by stringing the OPGW on the existing 66kV steel towers to the same dome joint, if the structural requirements can be satisfactory confirmed by the Contractor. This option shall be priced in Price Schedule 1 and Schedule 4.

See description below:

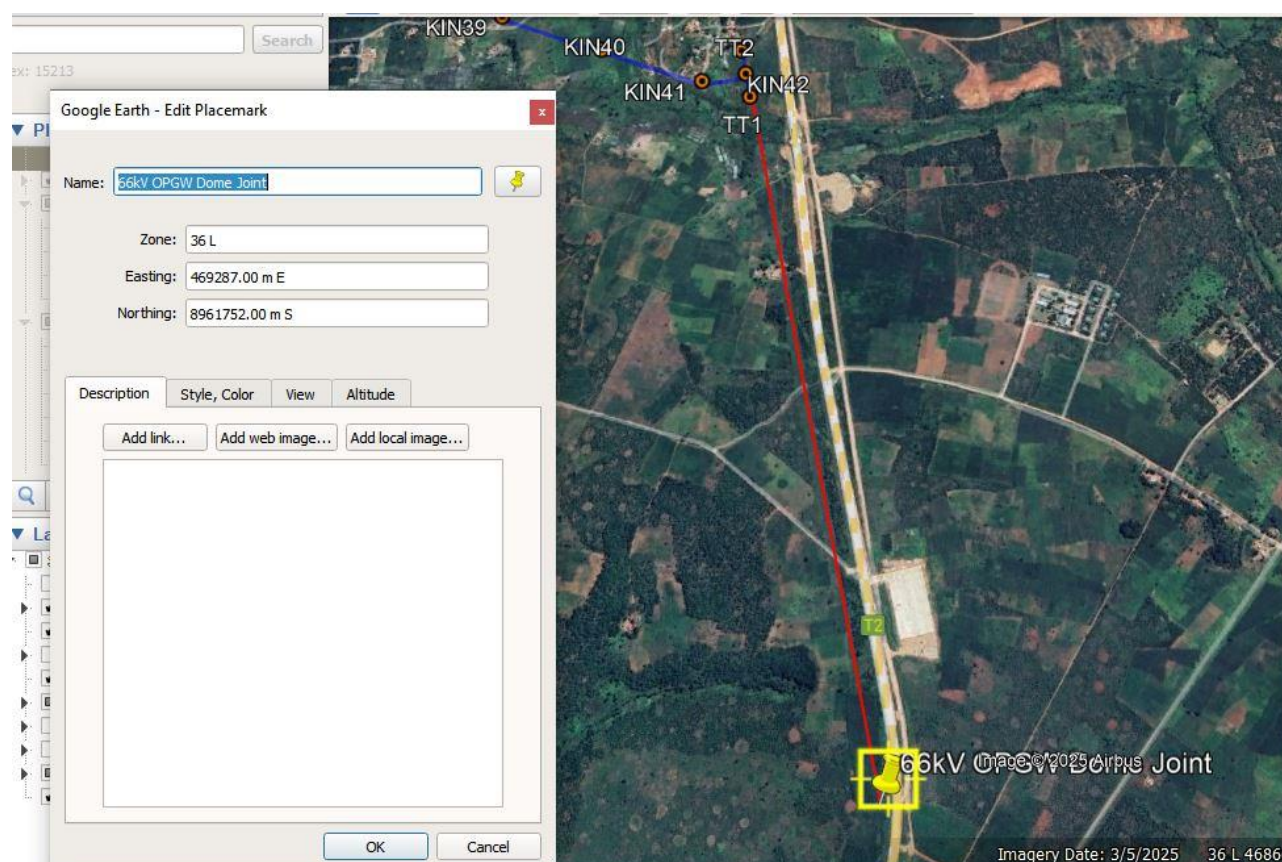


Figure 1: 66kV line Isoka - Nakonde Town, OPGW Dome Joint box for connecting the ADSS or (Option) OPGW towards 330kV Nakonde Stepdown S/S, distance ~ 2,5km

2.7 Additional scope

If necessary, the Contractor shall also be required to:

- Divert the line from its original route to avoid building and other obstructions, undertake preliminary surveys to select the route and a detailed survey, including tower spotting and other relevant engineering, for such diversions for the approval of the Employer.
- Terminate conductors/earth wire and install downloads on existing double circuit terminal towers if requested.
- Undertake the design of special foundations in soils (swampy areas) with extremely low bearing capacities which may not be within the specified values of the Specification or fractured non-homogenous rocks.

- Undertake soil investigations and geotechnical analysis to determine the type of foundations to be provided in special soils such as swamps with very poor properties.
- Undertake re-spotting of the towers in special soils, if necessary.
- Construct access roads to towers in such special areas.

The Contractor should provide the unit rates for such activities and indicate these in the price schedules. Otherwise, all works not itemised in the Price Schedules shall be deemed to be included in the contract price.

2.8 Interfaces and Co-ordination

2.8.1 General Interfaces and Co-ordination

The Contractor is required to manage and be responsible for the interfaces and coordinate with the other Contractors undertaking works related to the construction works as necessary. The primary interfaces between the Contractors or other parties are indicated below.

- Scheduling and coordinating of all required outages for the stringing across high voltage overhead lines under the operational control of ZESCO Limited in Zambia.
- Scheduling and coordination of all stringing across public roads/carriageways and railways with the road, rail and/or traffic police or other relevant authorities.
- Scheduling and coordination of all heavy transport, workers’ accommodation campsites, storage areas and field offices with the local area councils and all other requisite authorities.
- Coordinating all design work while ensuring that all components of the overhead transmission system are compatible to permit the connection between each other in terms of dimensions and design loads.
- Scheduling and coordination of all substations works where there is more than one Contractor carrying out works on the same substation

2.8.2 Specific Interfaces and Co-ordination

Specifically, the Contractor is required to develop and maintain an **Interface Control Document (ICD)** detailing coordination with other packages (e.g., Package 4 Nakonde S/S) and TANESCO. Subject to the Employer’s approval, this should describe responsibilities, milestones (e.g., handover dates for line bays), dispute resolution, earthing/telecom handoffs, and tower geometry at substations, and include a detailed Interface Matrix as part of the ICD, which should explicitly define responsibilities, timelines, and liabilities.

If a TANESCO contractor is not ready on time, the Contractor may be entitled to an extension of time and associated costs if delays are directly attributable to the non-performance of the interfacing contractor on the Tanzanian side, subject to providing auditable proof.

For cross-border stringing (phase conductors, GW, and OPGW): The Contractor is required to coordinate with TANESCO for the border span, where one terminal tower is on Zambian side and one on Tanzanian side; Stringing across the border requires joint permissions for customs/equipment crossing, synchronized schedules, safety protocols (temporary earthing, no-fly zones), and joint inspections/testing of the span. Responsibilities (ZESCO handles Zambian tower, TANESCO Tanzanian), milestones (e.g., stringing completion 3 months before commissioning), and dispute resolution via bilateral meetings should be included in ICD.

For substation stringing: The Contractor is required to terminate lines at gantries via dead-end towers; Supply/install jumpers from gantry to terminal points (e.g., a feeder disconnect terminal or a line post insulator); String should account for sag/tension at gantry height; The Contractor should perform the final connections during joint commissioning with Package 4; Provide as-built drawings with phase configurations / clearances.

For line transpositions: The Contractor is required to implement complete transpositions on Kasama-Nakonde 330kV using 330DT towers for phase balance on long lines.

For line crossovers (e.g., existing lines/roads): The Contractor is required to use conductor arrangements maintaining clearances (EN 50341, e.g., 10m over roads); Use PLS-CADD for spotting; include phase rotation diagrams in tower schedules.

The minimum interface points and responsibilities between Package 3 (Transmission Lines), Package 4 (Substations) and TANESCO are summarized in **Table 1 – Interface Register**. The Contractor shall develop and maintain a detailed Interface Control Document (ICD) expanding this register.

The Contractor shall examine the interfaces of Works with others as indicated above and shall be responsible for any missing interface activities or works items supplied and/or executed as necessary to complete the works and shall not make any claims on the Employer in relation to interfaces above, whether specified or not.

Notwithstanding the foregoing, if delay or disruption is directly attributable to non-performance of an interfacing contractor (including TANESCO-side works), the Contractor shall be entitled to Extension of Time (EOT) and demonstrable time-related costs, subject to the notice and records requirements of the Contract.

Table 1 Interface Register (Package 3 – Package 4 – TANESCO)

Ref	Interface location	Package 3 – Transmission Line Contractor	Package 4 – Substation Contractor (ZESCO side)	TANESCO / TANESCO Contractor	Notes / Key documents
IF-01	330 kV Kasama S/S – 330 kV Kasama– Nakonde OHTL	Align with line bays, design, supply and erection of terminal towers outside Kasama S/S; stringing, downleads and jumpers from terminal towers to 330 kV gantries; terminations of conductors, OHGW and OPGW at gantry; line side earthing connection to S/S earth grid; OPGW tests up to first joint box.	Design and construction of 330 kV line bays and gantries; foundations for gantries; S/S main earth grid and defined connection point for line earthing; underground fiber from OPGW joint box to ODF/telecom panels; bay equipment tests and integration into SCADA.	N/A	Terminal definitions as per ER “Description of 330 kV OHTL Kasama – Nakonde Stepdown S/S” and line terminal points.
IF-02	330 kV Nakonde Stepdown S/S – 330 kV Kasama– Nakonde OHTL	As per IF-01, at Nakonde end: terminal tower(s), jumpers and droppers, stringing, conductor / OHGW / OPGW terminations and line earthing up to gantry connection; OPGW tests to joint box.	330 kV Nakonde line bays and gantries; S/S earth grid and line earthing bonding point; underground fiber from OPGW joint box to ODF; integration of protection/telecom with OPGW fibers.	N/A	Ensure tower spotting & gantry geometry coordinated in ICD; Package 4 to issue final gantry coordinates & elevations.
IF-03	330 kV Nakonde Stepdown S/S – 400 kV Nakonde– Tanzania Border OHTL	Align 400 kV terminal tower(s) outside Nakonde with line bays; stringing, downleads and jumpers to 330 kV gantry (insulation levels and arcing horn arrangement per ER); OHGW/OPGW terminations and line earthing; OPGW tests to joint box.	330 kV line bays and gantries for the interconnector; S/S earth grid and bonding point; underground fiber from joint box to ODF / protection & telecom equipment; any required VT/CVT interfaces for line differential or teleprotection.	N/A	Nominal operation at 330 kV (not 400 kV) at this stage; clear insulation coordination responsibilities in ICD.
IF-04	Cross-border span – 400 kV Nakonde– Tanzania Border OHTL ↔ TANESCO 400 kV line	Design of Zambian terminal tower at border; mechanical & electrical design of cross-border span (final stringing of conductor, OHGW and OPGW across border); joint inspection and testing of span; provision of OPGW dome joints and splicing at the border crossing and all phase conductor jumpers and insulators including all connections. Coordination with TANESCO for joint inspection, testing, and commissioning/ acceptance activities.	None (substation-side only, except coordination on protection/telecom).	Design and construction of Tanzanian terminal tower; where TANESCO side is “second” contractor, responsibility for final stringing of conductors / OHGW / OPGW across border as per agreed sequence; interface drawing approval; coordination of outages, work permits, and safety procedures.	Sequence details to be frozen in ICD with TANESCO (tower coordinates, phase arrangement, tension/sag tables, safety rules).

Ref	Interface location	Package 3 – Transmission Line Contractor	Package 4 – Substation Contractor (ZESCO side)	TANESCO / TANESCO Contractor	Notes / Key documents
IF-05	Cross-border OPGW & telecom – ZESCO ↔ TANESCO	Supply and stringing of OPGW across and up to the border joint box; testing of fibers on ZESCO side up to joint; provision of OTDR test records and fiber allocation schedule.	None (substation side only, except integration to and coordination on protection/SCADA/voice/data systems(telecoms))	Supply and stringing of OPGW from Tanzanian terminal tower to border joint box; testing of fibers on TANESCO side; provision of compatible OTDR records and fiber allocation; onward termination to TANESCO ODF and systems.	ICD to include agreed fiber allocation (protection / SCADA / spare), connector type, test procedures and acceptance criteria, and which party leads cross-border end-to-end tests.
IF-06	132 kV Nakonde Stepdown S/S – 132 kV Nakonde–Isoka LI-LO OHTL (initially 66 kV)	Terminal towers, stringing, downloads, droppers and terminations of conductors and OPGW at 132 kV gantries; line earthing up to gantry; OPGW tests to joint box.	132 kV bays and gantries in Nakonde Stepdown S/S; earth grid and TL bonding point; underground fiber from joint box to ODF; bay protection and telecom equipment.	N/A	Note initial operation at 66 kV on 132 kV design; any temporary equipment or settings (e.g. VT ratios, protection) to be covered in ICD and commissioning plan.
IF-07	Connection of new 132 kV line to existing Isoka–Nakonde Town 66 kV line (LI-LO)	New 132 kV LI-LO OHTL (towers, foundations, conductors, OPGW); T-junction tower and downloads to existing 66 kV line; ADSS/OPGW arrangement and new joint box on existing line, including 2.5 km ADSS option on wooden poles, if adopted.	Substation side only (Isoka and Nakonde Town 66 kV S/S) , protection changes, and ODF connections at both substations. No bay modifications and 66kV side other modification is expected.	N/A	ER gives both base arrangement and “Option” of using existing towers for OPGW; choice and detailed checks (mechanical utilization) to be documented by Package 3 and approved by Employer.
IF-08	OPGW / telecom interfaces at Kasama, Nakonde Stepdown, Isoka & Nakonde Town S/S	(Kasama and Nakonde Stepdown only) OPGW supply & stringing, downloads, joint boxes at each S/S gantry; fiber tests up to joint boxes; provision of as-built link diagrams and fiber schedules.	(Isoka and Nakonde town) Underground fiber between each joint box and substation ODF; termination hardware; telecom equipment (RTU, SCADA, teleprotection, voice etc.) and end-to-end testing inside the substation fence.	N/A	ER assigns joint box vs ODF responsibilities; this row simply consolidates them for the Interface Control Document.
IF-09	Earthing & step/touch potentials at line–substation interfaces	Line earthing design up to defined connection point on S/S earth grid; tower footing resistance and shield wire continuity; measurement and reporting at terminal towers; continuous counterpoise earthing for the first 1.5km on 400kV Nakonde Stepdown-border, 330kV Nakonde Stepdown - Kasama and Nakonde Stepdown 132kV-66kV Isoka/Nakonde town lines and bonding to the	Design and installation of S/S earth grids (Kasama, Nakonde Stepdown); step/touch potential compliance inside the fence; definition and provision of earth grid connection points for each line.	For border span substations, TANESCO is responsible for its own S/S earth grid and connection to its terminal tower.	Interface drawings to show exact earth bonding details (conductor size, connection type, test points). Final earthing test responsibilities and methods to be described in ICD.

Ref	Interface location	Package 3 – Transmission Line Contractor	Package 4 – Substation Contractor (ZESCO side)	TANESCO / TANESCO Contractor	Notes / Key documents
		substation earthing grid			

2.9 Spare Material

The Schedule of Prices sets out quantities of Mandatory Spare materials which are required by the Employer, which will be paid for at the rates entered in the schedule, as incorporated into the Contract.

In the event that the Employer have not listed items in the Price Schedule Section No. 6, Recommended Spare Parts and Special Tools, the Contractor may amend Section 6 with spare parts and tools deemed necessary for the project.

Should any spares other than the scheduled spare materials be required, they should be ordered prior to the completion of final delivery of the comparable item being supplied under the Scheduled Works Quantities or may be subject to adjustment.

Any spare material shall be strictly inter-changeable with the parts for which it is intended and be packed, treated in a manner suitable for storage in the tropical climate which prevails in Zambia, the Site and the project area as a whole.

This packaging and topicalization treatment shall be such as to provide safe storage for an indefinite period and each package or part is to be clearly marked, identifying contents by item and quantity, where applicable.

Spare towers and tower materials shall be delivered in sets for each individual support, as well as a selection of plain, undrilled, rolled steel angles in 6.0m and/or 12.0m lengths, together with plates, bolts and nuts as indicated in the Schedule of Prices for Spare Materials. This material shall be galvanized and be a representative selection of the sizes and thickness used for the towers supplied under this contract. They shall be equal in strength to the highest grade of steel used for equivalent tower components.

The additional quantities to be supplied shall be confirmed by the Employer before delivery.

2.10 Contractor Accommodation and Site Storage

The Contractor shall make his own arrangements regarding accommodation and transportation for his expatriate and locally recruited staff during the construction period. The Contractor shall also make his own arrangements for storage areas and campsites as detailed in the Specification.

2.11 Employer office, accommodation, transport and communications equipment

The Contractor shall provide offices, accommodation and transport as required by the Employer's supervisory staff for the duration of the contract. For details refer to 3.15.

2.12 Factory Acceptance Testing (FAT)

FAT shall be performed at the manufacturer's facilities for all major components (e.g., conductors, insulators, towers, OPGW, hardware) to confirm compliance with specifications. The Employer or Supervising Engineer may witness these tests. Minimum requirements include:

- Conductors and OPGW: Dimensional checks, tensile strength (per IEC 61089 for ACSR), DC resistance, short-circuit withstand (40kA/1s for arcing horns, 31.5kA/1s general), and fiber optic parameters (attenuation, PMD per ITU-T G.652D/G.655).
- Insulators and Fittings: Dielectric tests (power frequency withstand, impulse), mechanical load tests (per IEC 60383), pollution/altitude corrections (Ka=1.08-1.16 per IEC 60071-2), and corona/radio interference voltage (RIV) tests.
- Towers and Foundations (Prototypes): Structural load tests (per IEC 60652), galvanizing thickness (per IEC 1461), and material certifications (e.g., steel per EN 10025).

For the 400kV line, FAT shall verify full 400kV insulation levels (e.g., lightning impulse 1,425kV, switching impulse 1,050kV) even though initial operation is at 330kV.

Test reports, certificates of conformity, and traceability records. Any deviations require Employer approval.

The bidder shall estimate participation of four (04) personnel per FAT session (Three Employer Representatives and one Engineer Representative). The days will vary depending on the equipment to be tested and some tests could be grouped together and attended by one group of people from a minimum of seven (07) days.

The Employer and Engineer shall be responsible for their own costs of FAT (air travel, per diems, accommodation).

2.13 Training

The Contractor shall include the costs of training facilities and logistics in the Price Schedule for all training to be provided by the Contractor. All training is considered to be provided outside the Employer’s country (foreign based) except as otherwise indicated. No per diem to be included.

The price shall include:

- The training course and facilities/logistics
- Local transportation

List of Training courses:

Item	Description
1	Training in Transmission Line Design, Testing and Commissioning Procedure including two (02) sets each of PLS-CADD/TOWER/POLE /STAAD licenses valid for the entire contract duration. 6 staff. Minimum 14 days.
2	Training in Structural Analysis and Design using STAAD PRO/REVIT/BENTELY including software licence valid for three years, 6 staff, Minimum 14 days.
3	LiDAR Survey Training with emphasis on GPS Field/Ground Survey data observations and Digital Image Processing: 4 Staff. Minimum 14 Days.

4	GIS and Remote Sensing Training: 4 Staff, , Minimum 14 Days.

3 GENERAL INFORMATION AND REQUIREMENTS

3.1 Introduction

This information is provided as guidance to Bidders in preparation of their Bids.

The Employer takes no responsibility for the accuracy of the information provided herein, or for any conclusion that the Bidders may draw from it. It is the entire responsibility of the Bidders to check and validate the information provided and to obtain any further data that may affect their Bids and the Works prior to its preparation and submission.

Bidders shall be deemed to have inspected the Site, its surroundings and satisfied themselves as to the true nature of hydrological, physical and climatic conditions of the proposed transmission line route; the ground, subsoil, form and nature of the sites and the works, the means and access to the sites, the accommodation which might be required and, in general, shall have obtained all necessary information as to risks, contingencies and other circumstances which may influence the Bid.

3.2 Language

The official language of Zambia is English, but the main spoken language in the project area is Bemba.

3.3 General Technical Requirements

The purpose of this section is to specify the basic conditions for the design and the supply of the materials and the equipment for the Works described in, Section 1 General Description of Project in respect of this Contract.

It is not the intention of these Specifications to specify any design detail, which is the full responsibility of the Contractor as specified in the Scope of Works. It is left to the experience and practice of the Contractor, who shall furnish equipment which shall meet, in all respects, the basic requirements as specified herein with regard to performance, durability and satisfactory operation.

Certain materials, features and design requirements are specified herein. Any deviations from these specific requirements must be approved by the Employer in writing.

3.4 Distance Between Relevant Town and Harbours

Zambia is a land linked country with much access coming from neighbouring countries and ports.

From/To (km) [Journey distances]	Pensulo	Mpika	Kasama	330kV Nakonde Stepdown
Pensulo	-	209	418	562
Mpika	209	-	214	354
Kasama	418	214	-	239
330kV Nakonde Stepdown	562	354	239	-
Lusaka	547	646	854	1018
Kabwe	305	506	714	878
Kaputa	724	612	398	600
Solwezi	617	818	1027	1100
Beira Port	1503	1292	1501	1724
Dar es Salaam Port	1493	1285	1170	932
Maputo Port	2023	2224	2433	2596
Mombasa Port	1796	1588	1473	1235

3.5 Climate

The region has a humid subtropical climate, with warm rainy summers and pleasant, dry winters, with most rainfall occurring during summer.

There are three distinct seasons in Zambia: ¹⁾ the wet hot (rainy) season from November - April, ²⁾ the cool dry season from April – August, and ³⁾ the hot dry season from August - November.

3.5.1 Rainfall

During the rainy season the annual average rainfall is ~1,300 mm mainly occurring in the form of thunderstorms and downpours. The highest rainfall during the year occurs between December and February with 260 mm of rainfall in each of these months. The wettest regions are those located in the North of Zambia; the Copperbelt province, the North-Western province and the Northern province.

3.5.2 Temperatures

The average daily temperature ranges between 16°C to 24°C with monthly average highs ranging from 25°C and 31°C and average lows of 8°C to 16°C in the cooler months from mid-May to mid-August.

3.5.3 Relative Humidity

The region experiences seasonal variations and have very humid months, the most humidity reported in January at over 80% on average. Throughout the remainder of the year the humidity ranges between 44% to 69%, with the lowest humidity levels occurring in August and September. Cooler Oceanic air begins to move into the regions by mid-October, rapidly increasing the humidity.

3.5.4 Wind

The average wind speed has significant variations between seasons. The Northern province is recorded to have generally calm winds with the windiest month in October, when the average wind speed is 4,95 m/s. Throughout the rest of the year the average daily wind speeds are relatively low and range between 2,7 – 4,5 m/s. The region rarely experiences sustained high winds exceeding 9,8 m/s. Design wind (gust, 3 sec.) is 36 m/s (q0≈~800 Pa).

Design wind speed is a matter that Bidders must satisfy themselves of, ensuring the anticipated maximum wind and rational economic criteria are utilized in determining all transmission structure design. Data to be entered in the Technical Schedule, 0.1. Climate Conditions.

3.6 Geology (Soils and Vegetation)

Package 3 is located in an area of dambo zones (seasonal or permanently wet grassy valleys/depressions) and floodplains. The dambo zones are generally identified as sandy soils while the floodplain soils are clayey. Refer to the soil map below:

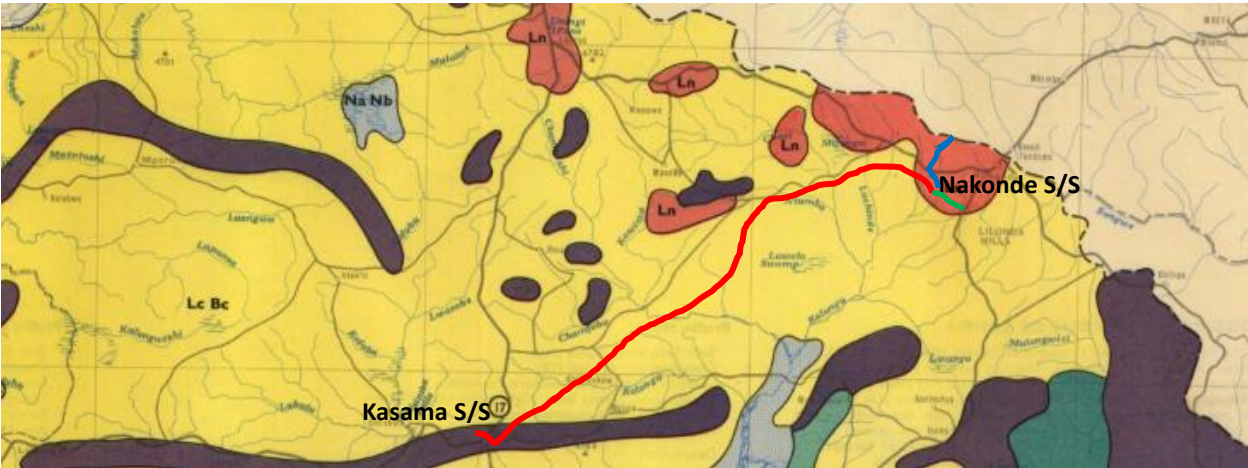


Figure 2: Selected area of Soil Map. (Source: https://esdac.jrc.ec.europa.eu/images/Eudasm/Africa/images/maps/download/afr_zm2006_so.jpg)

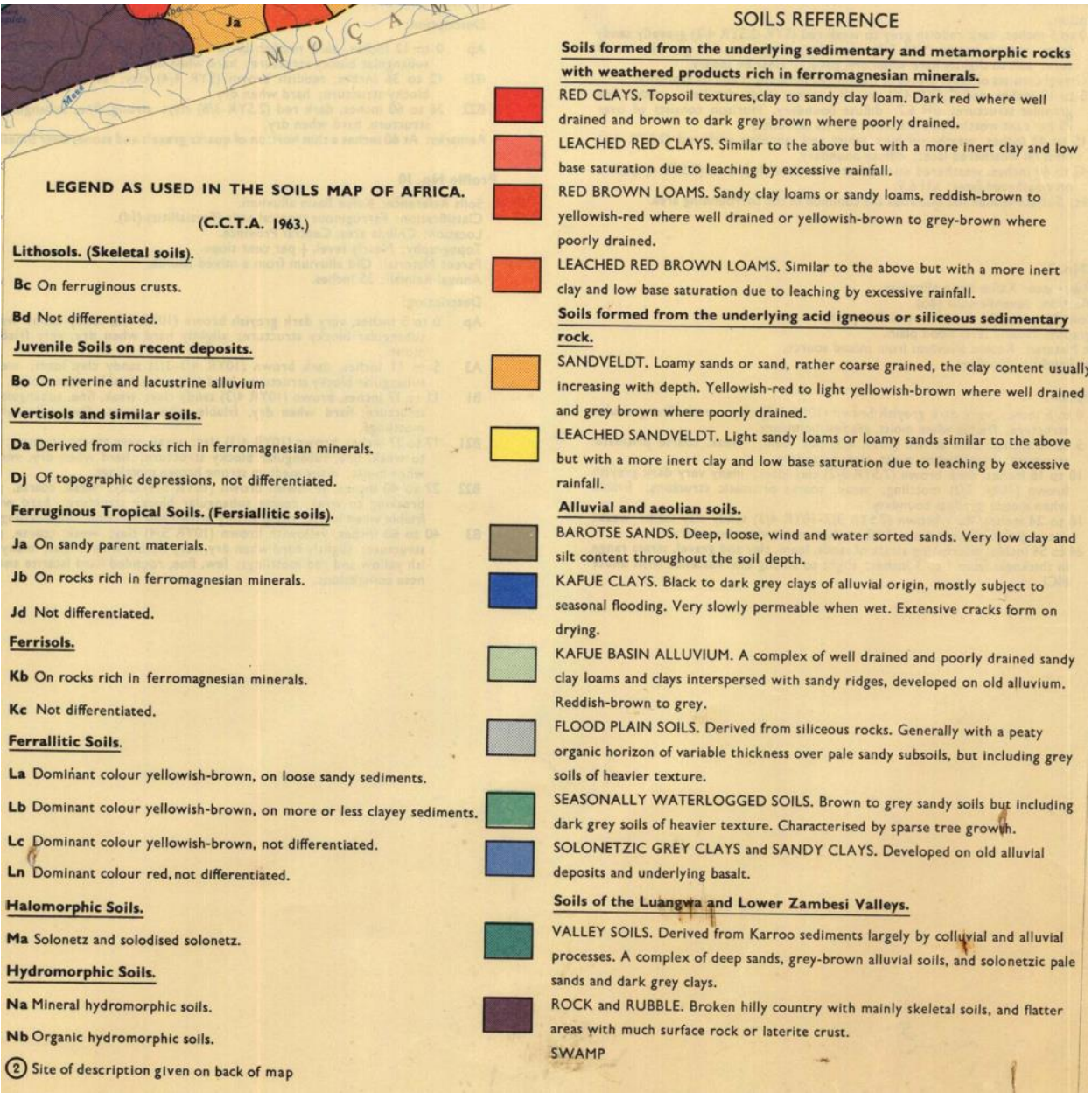


Figure 3: Soil Map Legend, same map as in Figure 2 above (copy of lower right side of the original map)

3.7 Seismology / Earthquake Intensity

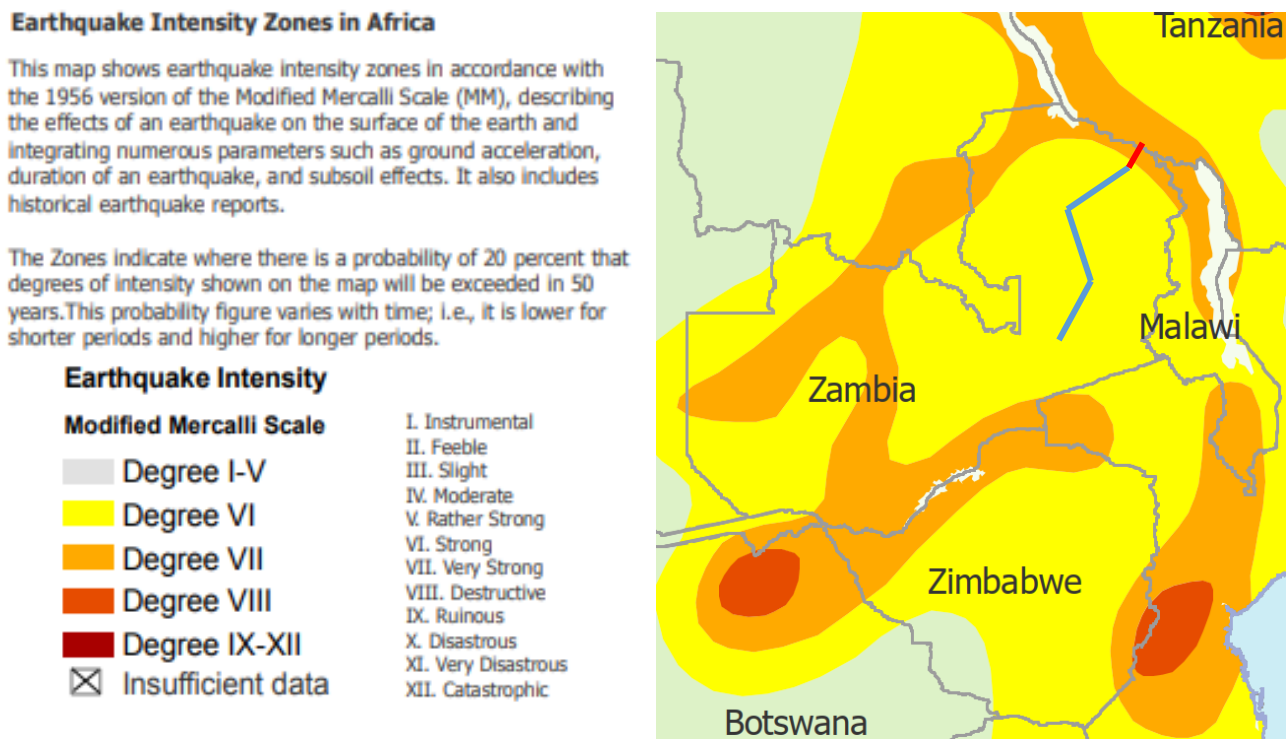


Figure 4: Earthquake Intensity map (source: https://www.preventionweb.net/files/7483_OCHAROCEA_Earthquakesv2071219.pdf)

The 330kV line route from Pensulo, via Mpika and Kasama to Nakonde (blue line in Figure 4 above) and associated substations are located within the Degree VI zone (0,12 g_o, 1,2 m/s²) whereas the 400kV OHTL to TANZANIA are located in Degree VII zone (0,22 g_o, 2,2 m/s²) (red line in figure above), i.e. same design as on the Tanzania side.

3.8 Topography

Zambia is mainly recognised as a high plateau laying between 910-1370m (3000-4000 ft) above sea level with some mountainous regions located in the centre and the north. Miombo woodland is the country’s most prominent vegetation in southern Zambia, while the Northern province is encased in rift valleys. The Mafinga Hills include the highest elevation in the country at 2301m above sea level.

The altitude design level is 1600m above sea level for the 330kV and 132kV lines, and 2200m for the 400kV line to conform with the design level on Tanzania side.

Much of the country is drained by the Congo River and the Zambezi River. The northern province is filled with rivers, streams and dambo regions. There are three large natural lakes located in the North of Zambia; the Bangweule, Mweru and Tanganyika and two bordering rivers, the Chambeshi and Luangwa, with the Chambeshi River feeding the floodplains in Mpika.

Mining is important to Zambia’s economy and accounts for roughly 20% of gross domestic products, leaving agriculture relatively unimportant. The mining sector is concentrated in the Copperbelt province and North-Western province. Mainly mining copper-gold ore, copper and uranium.

3.9 Construction Materials

Most materials to be used in or on the work, such as aggregate for concrete, sand, bricks, etc, are available on the local market. It may be advisable, due to shortages on the local market, to import cement materials and reinforcement steel to cover the Project demand of these and other such materials as Bidders may ascertain to be in short supply or unavailable within Zambia.

3.10 Communication Systems

Bidders are to note that the Contractor will be obliged to make its own arrangements for any telephone communication required for Site Offices during the contract period in accordance with the telegram and telegraph regulations of the Government of Zambia. Radio communication may be permitted, upon approval to the Independent Broadcasting Authority (Zambia) and ZESCO.

3.11 Power and Water Supply

The Contractor shall make all necessary provisions for power and water supplies required for the execution of the Works under the Contract.

If electricity supply can be made available at the Site for the use of the Contractor, the power consumed shall be paid at the amount fixed by the Employer. No guarantee is given or implied against interruption or failure of such power supply. Any provision and stand-by capacity required by the Contractor shall be his own responsibility.

In the locations where low-voltage electricity supply is not available at the Site from the public network, the Contractor shall provide his own generators.

The Contractor shall make his own arrangements for providing all the water required for the work and sufficient storage capacity shall be installed on the Sites to ensure an uninterrupted supply at sufficient delivery pressure for all construction purposes.

3.12 Labour Market, Labour Laws

Employment of skilled and unskilled labour, local and foreign, can be arranged on the local market.

The Contractor shall be responsible for acquainting himself with and observing all Labour Legislation of the Government Zambia including the Zambian Employment Act (1965) and any amendments and additions thereto.

The Contractor shall obtain resident, and work permits for skilled staff he intends to deploy from his home country. Prior to deploying the staff, the Contractor shall submit CVs of such personnel and obtain the approval of the Employer in writing.

3.13 Gasoline, Oil Lubricants

Gasoline, oil and lubricant products of various supplies to be used in or on the Works are available on the local market.

3.14 Accommodation and Site Storage (Contractor)

3.14.1 General:

Without prejudice to the generality of the several clauses of the Contract and except for the facilities referred to in this Clause, particular attention is drawn to the obligation of the Contractor to make his own arrangements at his own expense for supply and furnishing of offices, workshops, stores and store compounds and the watching and guarding of such.

3.14.2 Living accommodation:

The Contractor shall make his own arrangements with regard to accommodation for his expatriate and locally recruited staff during the construction period. All dwellings and buildings existing or erected for the purpose by the Contractors shall comply with local regulations with regard to construction, water supply, sanitation and specific environmental regulations and specifics stated for this Project. The Contractor shall be responsible for the construction and provision of all electrical supplies, water supplies, living accommodation, catering, services and amenities required by his employees for the duration of the Works. The location of all such facilities will be subject to approval by the Employer

Any temporary accommodation shall be removed by the Contractor when no longer required and before the granting of the final certificate. After the removal of the accommodation the ground shall be left in a clean and tidy condition. All requirements as per local laws and regulations, ESMP and ESIA shall be strictly followed.

3.14.3 Medical facilities:

Medical facilities will not be provided by Employer and the Contractor shall be required to make his own arrangements where these services may be required for his expatriate or locally engaged staff. The Contractor shall ensure that an ambulance and paramedics are available on call. However, the Contractor shall ensure that First Aid facilities are available at every site.

3.14.4 Staff transport:

The Contractor shall provide, at his own expense all necessary transport for his own staff and materials.

3.14.5 Storage facilities:

The Contractor shall make his own arrangements for storage areas and campsites. The Contractor shall in all cases obtain the approval of the Employer for the places along the route of the line where he intends to store materials. In no case will this be outside the authorized area unless special arrangements are made with the owners of adjacent property, at the Contractor’s own expense. The Contractor is to provide any necessary protection and watchmen to safeguard materials in the areas allocated to him. The handling and storage of any equipment at the site is to be at the risk of the Contractor and without responsibility to the Employer. The Contractor is to arrange for the protection to the satisfaction of the Employer, of these materials against vermin attack, corrosion and mechanical damage during storage and erection at site.

The site storage areas shall be prepared with adequate hard-standing for the orderly storage of conductor drums, tower steel, insulators and fittings so that the material will not be damaged by the effects of adverse weather during storage. Items packed in flammable crates or drums shall be stored in such a manner as to limit the extent of any damage arising from fire.

3.14.6 Compressed air:

The Contractor is to make his own arrangements for a supply of compressed air if required for the execution of the contract work.

3.14.7 Lifting facilities:

The Contractor is to make his own arrangements with regard to lifting facilities required for transport at stores or on site. The lifting facilities should be tested, certified and carry a valid local certificate from The Zambia Metrology Agency (ZMA) for lifting the intended load.

3.15 Employer office, accommodation, transport and communications equipment

3.15.1 Office accommodation

The Contractor shall provide offices as required by the Employer’s supervisory staff for the duration of the contract. The offices shall be located at a place agreed with the Employer prior to the start of works. No permanent work shall be commenced without agreed suitable office(s) being ready for occupation and use as indicated.

The Contractor shall provide at least one fully furnished, air-conditioned, and sound and weather proofed site office block, complete with electrical power and light fittings, plumbing and sanitary systems to the approval of Employer.

The office blocks shall be located adjacent to the Works area and as directed or approved by Employer. Each office block shall consist of three office rooms, and each office room shall have a floor with a floor area of not less than 20m².

Toilet and washroom facilities shall include air extraction fans, western style WCs, urinals, washroom and shower and washbasins with hot and cold water. Water and effluent shall discharge into a suitably sized septic tank unless connected to a public sewer system.

Each office blocks shall also be provided with a kitchen, including 1 No hob and oven, refrigerator, water cooler, hot and cold water supply, sink, drainer, microwave oven, cupboards, and worktops.

The following equipment and furniture shall be supplied to each office block:

- Internet Access (24/7), through StarLink, etc.
- LaserJet colour printer (medium duty), A3 / A4
- Medium duty photocopier
- Office consumables (A3 and A4 paper, toner, etc.)

- Scanner machine
- Digital camera
- Projector
- Office tables
- Office chairs
- Shelves and bookcases
- Other furniture as required
- Split type AC unit
- Fire extinguishers.

UPS system shall be provided to support the computer system in the event of a power failure. The computers and printer shall be networked on a LAN with facilities to access the Internet (broadband) on a continuous basis. The Contractor shall be responsible for all associated charges and costs.

All equipment and consumables shall be stocked, maintained and replaced by the Contractor on a regular basis for the duration of the Contract as necessary.

For all site services specified, all the associated costs for the full contract period are deemed to be included in the contract price.

During the construction period and time for completion of all outstanding items, the Contractor shall provide a daily refuse collection and disposal service to be loaded, transported and dumped at areas where prior permission has been obtained from responsible authorities in order to keep the total offices and construction site areas clean and in safe condition.

Neglect of cleaning by the Contractor may lead to waste removal by others and the removal costs being deducted from payments to the Contractor.

3.15.2 Living Accommodation

The Contractor shall be entirely responsible for all accommodation of his personnel, and for provision of all other facilities regarding the accommodation and living. The Bidder shall include in his tender for the provision, at his site accommodation at each project area, three rooms, at least 4m x 5m for the sole use of the Employer and the Engineer. Each site accommodation room shall be furnished with one bed, 1 table and 2 chairs as a minimum. All dwellings and buildings existing or erected for the purpose by the Contractors shall comply with ILO, Project ESIA and ESMP and local regulations with regard to construction, water supply, sanitation and specific environmental regulations and specifics stated for this Project.

If the Contractor wishes to construct a camp (caravans, tents, etc.) to accommodate personnel on any property, he shall first obtain written permission from the Employer. It is recommended that the accommodation area should be fenced and guarded.

Proper sanitation shall be ensured by the contractor at all his accommodating facilities at site. Separate toilets and bathrooms for male and female employees shall be provided and adequately maintained during the construction period.

The location, construction and operation of any camp shall be subject to approval of the Employer and shall comply with the requirements of ILO, ESIA, ESMP, the Local Labour and Health Ordinances and any other applicable regulations.

When camps are no longer required for the construction of the works, and unless arrangements have been made to the contrary with the Employer, the Contractor shall remove all buildings, backfill all excavation with earth, (including latrine pits), and shall leave the area in a clean and neat condition, to the approval of the Engineer. The issue of the Final Certificate of Completion, and any payments due, will be withheld until the necessary cleaning-up has been completed.

No direct payment will be made to the Contractor for the construction or removal of camps, and the entire cost thereof must be included in the bid prices for the various works.

3.15.3 Access Road and Parking

The Contractor shall as a minimum standard provide a temporary sealed and free-draining hard access road to the site office.

Parking areas for at least 4 cars of the Employer shall be provided by the Contractor. These areas shall be located close to the working places (site offices and areas of construction) used by Employer.

The parking areas and site offices shall be indicated by the Contractor in the layout drawing for Site installation to be submitted for Employer approval during mobilization.

Design of all the works involved, e.g., sheds, drainage, cross section, surfacing marking etc. shall be subject to the approval of Employer. Design, construction, maintenance and removal by the Contractor shall be deemed to be included.

3.15.4 Temporary Lighting, Fencing, Security and Signage

The Contractor shall provide and maintain at his own cost all temporary lighting, fencing and security, complying in all respects to relevant local or national regulations and rules. In particular, such features shall be provided when and where necessary or as required by the Employer for the protection of the work and for the safety and convenience of the public.

At the entrance to the site, a signboard shall be provided and erected by the Contractor. The signboard shall comply with the regulations of the concerned authorities and shall show as a minimum the names and contact numbers of the Contractor and Employer, and a contact number in case of an emergency.

3.15.5 Removal of the Temporary Site Establishment

As soon as the work is completed and before the issue of the Taking Over Certificate, the Contractor, with prior approval of Employer, shall remove and clear away from the Employer’s property all temporary offices installations and temporary facilities erected above and below ground, such as foundations, septic tanks etc. The Contractor shall fill resultant voids in the ground with appropriate and compacted fill approved by the Employer, leaving the terrain completely clean and with a tidy appearance.

3.15.6 Electricity Supplies

The Contractor shall be responsible for providing, obtaining and making all arrangements for the use for the Works of supplies of electricity supply required (24/7), including the provision at his own cost of all apparatus necessary for such use. All precautions which are necessary to ensure the safety of every person on the Site shall be taken. The Contractor’s installation shall be to the satisfaction of the Employer who may require the disconnection or alteration

of any parts that he considers may be dangerous. Such installation shall comply with all appropriate statutory regulations and be in accordance with IEC 60364 and IEC/TR 61200-704.

As soon as any parts or whole of the Contractors installation is no longer required for carrying out the Contract Works, the Contractor shall disconnect and remove the same to the satisfaction of the Employer.

The Contractor shall be responsible for the installation and maintenance of a backup generator and/or a solar powered back-up system, including batteries, which shall provide the office accommodation with an electricity supply during power outages. The generator shall have the capacity to meet all office loads including lighting and air conditioning. The Contractor shall provide fuel for the generator throughout the duration of the Contract. The use of the generator is at the discretion of the Employer. The standby generator shall be sound proofed and shall be available for immediate connection at all times.

3.15.7 Water Supplies

The Contractor shall be responsible for providing, obtaining and making all arrangements for the use for the works of supplies of water required, including the provision at his own cost of all apparatus necessary for such use.

3.15.8 Communications/Internet

The Contractor shall also be responsible for providing, obtaining and making all arrangements for the supply of an internet connection to the Employers Office Accommodation, including the provision at his own cost of all apparatus necessary for such use.

3.16 Quality Management System

3.16.1 General

The Contractor shall carry out the Works in accordance with sound quality and environmental management principles, and in particular shall have management systems which conform to the requirements of the ISO 9000 family of standards for Quality Management, ISO 45001 for health and safety and the ISO 14000 family of standards for Environmental Management.

These quality management requirements shall apply to all activities including design, procurement, manufacturing, inspection, testing, packing, shipping, storage, site erection and commissioning.

The Contractor, any major sub-Contractors and suppliers shall also have Quality Systems certified as complying with the requirements of ISO 9001 applicable to sales, design, construction and commissioning of high voltage transmission line materials manufacture and/or construction and related Project Engineering design. Minor sub-Contractors and suppliers should preferably have similar quality certification, however if they do not the Contractor’s Quality System shall apply.

It is preferred that the Contractor be certified as complying with ISO 14001 and regardless of any such certification the management system must provide for all due care and responsible protection of the environment and the specified environmental protection measures are not to be seen as limiting the Contractor’s responsibilities in respect of environmental obligations.

All documents submitted by the Contractor, including those provided by sub-Contractors, in the course of the Works will not be accepted unless they include evidence that they have been verified by the Contractor.

3.16.2 Quality Documentation and Audit

The Contractor shall submit a copy of its Quality Manual and relevant quality procedures for the Project, in the English language, within 2 weeks of the Effective Date of the Contract. Quality Manuals from sub-Contractors and suppliers shall be submitted within 2 weeks of the Contractor making a commitment to them.

The Contractor shall clearly identify all quality records that will be used for the Contract. The Employer may undertake an inspection or quality audit of the Contractor’s or sub-Contractors’ facilities at any time. Full quality records of all procurement and manufacture shall be made available at the start of factory inspection and testing of equipment. Full quality records to the completion of installation shall be made available before the start of site testing.

3.16.3 Quality Assurance Plan

The Contractor shall ensure that its quality procedures address all requirements of the Works. Similar quality procedures for sub-Contractors, manufacturers and suppliers are to be ensured and the Contractor’s quality procedures are to provide verification of this.

The Contractor shall have an overall documented Quality Assurance Plan capable of providing assurance that all equipment, materials and services meet the Contract Technical Specification requirements.

The Contractor shall have a quality assurance unit or as a minimum a designated Quality Representative responsible for establishing and executing the quality assurance plan, which shall describe the overall quality management approach, the designated responsibilities and authorities. Quality assurance personnel or the designated quality representative shall be independent from those personnel performing assigned activities and shall have the organizational freedom required to resolve quality assurance problems.

The plan shall cover, as a minimum, the following areas:

- Design control;
- Procurement control;
- Document control;
- Control of inventory, including component identification, on site handling and distribution;
- Control of special processes, Inspection and Test Plans on which hold points and recommended inspections by the Employer are clearly shown;
- Control of all site works.

Quality Plans shall be subject to the approval of the Employer. An initial Quality Assurance Plan shall be submitted within two (2) weeks of the Effective Date of the Contract. A revised Quality Plan which includes full details of all Inspection and Test Plans shall be submitted within 2 months of the Effective Date of the Contract.

Not less than four (4) weeks prior to mobilisation to Site, the Contractor shall submit the Quality Plan revised to include a complete list of all site personnel detailing names, positions and responsibilities complete with an organisation chart. The Contractor shall provide for approval, full details including curricula vitae, of all Project Management, technical and other key staff to be employed at site. Personnel shall not mobilise to Site prior to approval being given.

The Contractor shall perform periodic documented reviews of his works and quality controls to assure conformance to the programme and contract requirements at six (6) month intervals through the contract period and provide the Employer with a copy of this review.

3.17 Quality Assurance Requirements

3.17.1 General

The Contractor shall have a well-organized Quality Assurance Program (QAP) based on ISO 9000, 9001 Series (Quality System Model for Quality Assurance in design / development, production, installation and servicing) to assure that items and services, including subcontracted items and services, comply with this specification.

All design, manufacturing, processing, testing and inspection operations affecting the equipment or material shall be governed by Quality Assurance procedures in accordance with the directives of the ISO 9001 standards while the production and installation shall be governed by quality assurance procedure in accordance with the directives of the ISO 9001 and 9002 standards. These may be subject to surveillance by the Employer or Employer’s Project Manager. A sample QAP shall be submitted together with the Bid.

Within thirty (30) days of the Effective Date of Contract, the Contractor shall submit one (1) hard copy and one e- version of his complete quality control and assurance procedures, manuals for review and approval by the Employer. The manual shall include pro-forma checklists for all requirements of the Contractor's quality control and assurance program and those called for in this Specification.

The Quality Control and Assurance Program to be submitted shall include but may not necessarily be limited to the following:

- Program requirements for Materials and Equipment Procurement and Manufacture with description on design control, purchased material control, quality verification tools, manufacturing control, materials and components selection, handling and packaging, etc.;
- Program requirements for Equipment Production with detailed description on Quality Assurance Organization of the Contractor, Quality Assurance Functions and Procedures and Performance Monitoring;
- Quality Assurance Program Tests with detailed description on the test procedures to be conducted;
- Quality Assurance Program requirements for installation and commissioning (for Design Supply and Install (DS&I) Contracts) with detailed description on Quality Assurance Organization of the Contractor, Quality Assurance Functions and Procedures, etc.).

Prior to manufacture, the Contractor shall submit to the Employer a fabrication sequence describing inspection and / or tests to be performed, for use in determining inspection points which the Employer may desire to witness. The Employer will advise the Contractor prior to manufacture of those fabrication steps and shop inspection points that the Employer desires to witness.

The Contractor shall give the Employer adequate notice, forty-five (45) calendar days minimum, prior to those fabrication steps and 8 weeks in advance for tests which the Employer desires to witness.

3.17.2 Quality Assurance Program

The Contractor shall, for all work covered by the Contract, establish and implement a quality assurance program which shall, as a minimum, meet the requirements set out in ISO 9001 and ISO 9002.

In addition to the requirements of these standards, the Contractor shall:

- Establish procedures for adequate planning of all quality related activities including the preparation of quality plans.
- Establish measures for the identification and control of items throughout all stages of the Contract. This shall include measures to maintain traceability as identified in agreed quality plans.
- Arrange for the protection of the quality of the product to include delivery to the specified destination.
- Control the calibration of measuring and test equipment in accordance with established procedures for measurements and calibration systems and ensure that such equipment that may be used by sub-Contractors to verify work is similarly controlled.
- Ensure adequate quality systems exist for compliance with the requirements of the Contract.

Where any site installation and / or test and commissioning work is involved, the Contractor shall prepare contract-specific quality assurance procedures in agreement with the Employer prior to commencements of such works.

The Contractor shall be responsible for specifying the quality assurance requirements to his sub-Contractors, for approving sub-Contractors' quality assurance program and for ensuring compliance with the requirements.

The Contractor shall ensure that all appropriate technical information is extracted from the Contract documents and specifications and passed on to the sub-Contractors.

The Contractor shall ensure that all computer systems and software to be utilized on the project is qualified for the application under consideration and such qualification is documented.

3.17.3 Quality Plans, Inspection and Test Schedules

Quality plans shall be prepared detailing the specific activities, design reviews, operations, control procedures, inspections, testing, approvals and certification requirements applicable. Quality plans shall be submitted to the Employer for review and approval.

Where inspection schedules are generated in support of a quality plan these are also required by the Employer for review and approval.

The format and content of schedules shall ensure that inspection operations are planned and performed in a systematic manner.

Documents referred to in quality plans shall be available to the Employer for review if required.

Specific quality plans shall be prepared for site work and submitted for review and approval by the Employer prior to commencement of such work.

The Contractor shall approve all quality plans, inspection and test schedules of its sub-Contractors and vendors.

The Contractor shall identify his verification requirements on the quality plans submitted to the Employer for review and approval and shall identify the following:

- Stages subject to random surveillance.
- Inspection that requires to be carried out or witnessed by the Employer or a third party following satisfactory verification and acceptance by the Contractor.
- Hold points beyond which work cannot proceed before completion of all operations, verifications and related activities identified after the previous hold point on the quality plan.

The Contractor shall be responsible for identifying and arranging any verification activities for statutory approval in the country of manufacture.

The Contractor shall adhere to the reviewed quality plan(s) and notify the Employer immediately of any deficiencies or difficulties should arise.

Where functional testing is required, functional test schedule(s) and / or procedures shall be prepared by the Contractor and submitted to the Employer for review and approval prior to the commencement of such testing.

3.17.4 Submission of Documents

The Contractor shall submit drawings and other documents for review and approval by the Employer as required in the Employer's Requirements and Quality Plans.

A schedule of drawings and all documentation for review shall be submitted to the Employer in accordance with GC 18.2 Work Program within 28 days from the Contract Effective date and shall be maintained by the Contractor to show the up-to-date status and revision of each document.

The Contractor is not authorized to proceed with manufacturing until notified that the drawings are satisfactory to the Employer, unless the Employer waives this requirement in writing.

The Employer's general review of drawings and data or waiver of the same shall not in any way relieve the Contractor of any responsibility to meet all requirements of this specification or the Contract.

3.17.5 Monitoring by the Employer

Employer reserves the right to request, review for the duration of the Contract a copy of the Contractors Quality Manual.

During the course of the Contract, the Employer reserves the right to monitor the implementation of the Contractor's quality assurance program. Monitoring will be by means of surveillance of activities at the work locations and where appropriate by formal audits. Representatives of the Employer shall be afforded unrestricted access and facilities at all reasonable times to carry out this work to verify manufacturer's compliance with the established manufacturing, assembly, delivery, including installation and commissioning schedules for a DS&I.

The Employer reserves the right to monitor sub-Contractor's activities and the Contractor shall ensure that sub-Contractors are informed of these requirements.

3.17.6 Records

The Contractor shall generate records as required by the quality assurance system and quality plans. Records, including audit reports shall be available for inspection by the Employer.

All records shall be concisely compiled, indexed and cross-referenced to the project contract number and they were relevant subcontract numbers. They shall be clearly identifiable to the individual parts and assemblies to which they refer.

Those records required by the Employer, as defined in the contract specifications and quality plans shall be available at the time of delivery of the equipment. Such records shall include reports and certification in respect of pressure retaining components together with general traceability records for all items through certification and build documentation as a minimum. E-copies of these records shall be supplied to Employer with the exception of radiographic films where the original set of films shall be supplied.

All records generated during the course of the Contract, including those generated as evidence of effective implementation of the quality assurance program of the Contractor and his sub-Contractors, shall be retained by the Contractor for a minimum period of five (5) years from the date of contract completion. These records shall be made available to Employer on request during the retention period.

3.17.7 Sub-orders

All orders for materials and equipment purchased by the Contractor specifically for this Contract are subject to inspection, tests and expediting. The Contractor shall advise the manufacturer of any interventions received from the Employer or his authorized representative(s).

The QA program shall contain a detailed list of all sub-orders placed with sufficient information to enable the inspectorate to function properly, including order numbers, manufacturer's identity, equipment specifications, delivery and dispatch dates, etc.

3.17.8 Material and Test Certification

One (1) copy of all tests results recorded during an inspection visit shall be handed to the Employer or his authorized representative(s) on that day. In addition, one hard copy and one E-copy of the test certificates will be required fifteen (15) days thereafter.

In the event that the inspection of any item is waived, test certificates shall still be required.

3.17.9 Particular QA Requirements

3.17.9.1 General

As a supplemental document to the QA program, the Contractor shall submit for approval of the Employer a separate document with detailed particular requirements and specific acceptance criteria of all equipment.

3.17.9.2 At Shop

Corresponding to each major and minor component of transmission line equipment, the following data are required for submission to and approval by the Employer:

- Test and inspection procedure;
- Guaranteed technical rated or design data;
- List of hold points and / or routine tests;
- Acceptance criteria and reference standards;
- Test results / data in comparison to the guaranteed data. All allowable tolerances with respect to dimensional control of assemblies and sub-assemblies at shop shall be clearly indicated in the manufacturer's drawings.

3.17.9.3 At Site

The tests at site shall be in accordance with the manufacturer's recommendation as approved by the Employer.

The Employer or his duly authorized representative shall control said site tests, in collaboration with the Contractor's representatives.

3.17.10 Packing and Marking

Careful packaging of all materials supplied for this contract is of utmost importance and is subject to the control of the Employer, so that the following aspects are checked:

- Packaged design and markings;
- Protection of contents against damage by mechanical shock, moisture ingress and adverse atmospheric conditions, corrosion;
- Material quality workmanship and manufacturing of packages.

3.17.11 Reporting and Corrective Action

The Contractor's quality assurance program shall provide for prompt detection and correction of all conditions adversely affecting quality, including failures, malfunctions, incidents, trends, deficiencies, deviations, non-conformances, and defective materials. The Contractor shall establish and maintain methods for verifying and determining the cause of an adverse condition and for initiating necessary improvement and corrections to preclude repetition. Quality trends shall be analysed to furnish a basis for improvement in work performance. The Contractor's corrective action system shall extend to the performance of other participating sub-Contractors and shall provide for the interchange of corrective action information. Identification of the adverse condition, its cause, and the corrective action taken shall be recorded and reported to appropriate levels of management.

The Contractor shall establish and implement procedures for reporting, verifying, analysing, and correcting failures, including those that occur during development and qualification testing. The procedure shall provide assurance that the cause and mode of each failure are determined, that potential safety and availability implications are evaluated, and that corrective action is taken.

A failure report shall be prepared to identify the failed item and its origin or source of manufacture and shall describe the failure, the test status at time of failure, the probable cause and mode of failure, and the recommended corrective action.

3.17.12 Design Revision and Substitution of Material

Any revision affecting the design and manufacturing of any transmission line component, as well as substitution of materials that is deemed necessary shall be notified by the Contractor to the Employer for the latter's review and approval prior to any implementation or order placement.

3.17.13 Contractor's Responsibility

Approval by Employer of the Contractor's quality assurance program, quality plans and inspection and test plans or of those of his sub-Contractors will not relieve the Contractor of his obligation to provide plant and equipment which meet the requirements of the Contract.

3.17.14 Information Required to carry out a systematic evaluation of the Contractor's quality assurance program

The following information is required in order to carry out a systematic evaluation of the Contractor's quality assurance program and should be compiled under the heading of Quality Assurance and structured as below:

- Statement of intent for the adoption of a documented quality system and acceptance of the requirements laid down in this specification.
- Details of any recent external assessments of the proposed quality system - through Second Party audit or Third-Party assessment. The results of such audits / assessments should be submitted together with details of any accreditation of the quality system.
- Details of the procedure for quality assessments of Contractors / Sub-Contractors together with recent assessments carried out. The list should include reference to the assessment standard, including the applicable part of such a standard.
- A contract specific quality plan together with supporting inspection and test schedules, as described in this Specification.
- Details of the procedures governing:

- Internal QA system audits
- Project audits
- Contractor / Sub-Contractor surveillance audits
- Details of QA records produced and typical examples.
- Details of the facilities for inspection and test.
- A schedule of drawings and documentation for review and approval by Employer.

3.17.15 Sub-Contractors and Suppliers

For each Sub-Contractor the Contractor shall identify the relevant quality standard ISO 9001, 9002 or 9003 to be selected in accordance with the guidelines given in ISO 9000-1 and in ISO 9000-3. The Contractor shall assess Sub-Contractors' quality systems and their implementation to confirm adequate qualification standard.

The Contractor shall plan and carry out Quality Surveillance (QS) of his Sub-Contractors (ref. ISO 8402, Clause 3.11) at a level of detail sufficient to ensure fulfilment of the quality requirements of the Contract. The Employer shall have the right to participate as observer in such QS activities.

The Contractor shall submit his QS-plan(s) to the Employer for acceptance and keep the Employer informed of any change thereof.

3.17.16 Contactor’s Quality Plan

3.17.16.1 Quality assurance and quality control programme

The parts and components produced and the services provided in fulfilling the requirements of the Contract shall be performed in accordance with a Quality Assurance Program to be established by the Contractor. This Contractor's Quality Assurance Program shall be documented in sufficient detail to assure the Employer that the Contract requirements will be met during the design, procurement, manufacture, assembly, delivery, erection, installation, construction and test of all materials and components of the Works. The Contractor's Quality Assurance Program, as a minimum, shall provide the implementing details as given hereinafter.

3.17.16.2 Quality plan

The quality plan concerns the civil works and the electrical equipment.

General

The Quality Plan prepared by the Contractor with reference to his Quality Assurance Manual and as per ISO Standard shall be submitted to the Employer.

This plan will reflect the know-how of the Contractor as well as the requirements of the Contract. Contractor's Quality plan shall include, but not be limited to, detailed procedures, instructions, or statement covering the following.

Organisation and procedures

The Quality Plan shall describe Contractor's Quality Assurance organisation and delineate the responsibility and authority of the various personnel and groups involved. The Quality Assurance Department's relationship with other departments shall be defined and their independence of Employer, construction, cost, and scheduling shall be stated. An organisational chart shall be included with lines of authority and communication.

Procedures of communications between the Contractor and the Employer will be established by the Employer. All documentation which is addressed to the Employer shall be copied to the Employers Project Manager.

Particular procedure will be established for communications on site.

Procurement Control

The Contractor's procurement process shall assure that purchased items, whether purchased directly or through the Contractor's sub-suppliers comply with the Employer's Requirements. This assurance shall be provided by the inclusion of the quality requirements into the Contractor's procurement documents and adequate inspection of the material at its source or upon receipt.

Prior to procurement, the Contractor shall furnish to the Employer, a list of Sub-Contractors and vendors with whom orders are to be placed for materials and equipment which will be incorporated directly into the Works. The Contractor shall also furnish such pertinent information as to capacities, efficiencies and sizes, and such other information as may be required by the Employer.

Copies of Contractor's unpriced orders of materials and equipment and list of his stock material or equipment shall be provided to the Employer. All orders and stock lists shall state the standard specification under which the material is to be furnished, pertinent drawing and the required delivery dates. They shall state that the materials and equipment are subject to inspection by the Employer.

Material Control

The Quality Plan shall provide assurance that procured, and subsequently processed material complies with the Employer's Requirements. Material identification shall be provided and maintained throughout the manufacturing cycle. Controls shall be provided for the documentation and quarantine of non-conforming material, parts or components, and their subsequent rework or repair and re-inspection. The program shall also provide for the prior notification to the Employer of proposed rework or repair or non-conformance, for the Employer's evaluation and approval.

Special Processes

Special Processes such as welding, soldering, brazing, heat treatment, cleaning, non-destructive examination, etc., shall be performed in accordance with documented process procedures and by qualified personnel. The procedure shall describe the process sequence and methods, process pre-requisites, equipment, qualification of personnel and equipment, and acceptance criteria. The procedures shall also describe the preparation and retention of documents used to record the results of special processes.

Non-Destructive Testing

Non-Destructive Testing (NDT) shall be done according to written procedures prepared by the Contractor. The current edition of American Society of Mechanical Engineer (ASME), Section V shall be used as a guide for the NDT procedures. In addition, the specific requirements of the applicable Code and Standard shall be satisfied, and the procedures shall be submitted to the Employer for review and approval prior to the initiation of the test.

The items to be non-destructively tested, the extent of testing, and the acceptance Standard shall be clearly defined in the procedures and in accordance with the referencing Code and Standard. NDT personnel shall be qualified and certified in accordance with the current edition of American Society of Non-destructive Testing (ASNT) Recommended Practice, number SNT-TC-1A or equivalent.

Inspection

The Quality Plan shall provide for the in-process and final inspection of material, equipment and activities to assure compliance with approved documents. Examination or measurements shall be performed at each applicable work operation. Inspection activities shall be performed by qualified individuals.

Calibration

Procedures shall be established to assure that test and measuring devices used to test, inspect, or accept material and components are calibrated at specified intervals to maintain the proper accuracy. Devices used shall be of the proper range, type, and sensitivity to reliably measure the parameters being evaluated. The calibration of such devices shall be documented and shall be performed using certified measurement Standards.

3.17.17 Approval of materials and equipment

3.17.17.1 General

All materials and equipment intended to be incorporated into the Works shall be subject to approval by the Employer prior to order by the Contractor.

Unless otherwise authorized by the Employer no material or equipment shall be shipped from its point of original manufacture or final shop assembly to the work site before it has been inspected and approved by the Employer.

3.17.17.2 Submission of samples and data

The Contractor shall submit for the approval of the Employer samples, drawings, catalogues, cuts, diagrams and other descriptive data for all structural, mechanical, electrical, architectural and such other materials and equipment as may be designated by the Employer and which the Contractor proposed to incorporate in the Works. For certain materials and equipment data may be required to be submitted in accordance with a detail form furnished by the Employer.

Items submitted by the Contractor shall be properly labelled to indicate the Project Contract number, Contractor, source of supply, Contractor Contract Item number, and other data required in the Employer’s Requirements.

All items shall be submitted in sufficient time, but not later than 90 days prior to purchase, to permit proper consideration and action thereon without delaying the construction schedule.

Items sent for approval shall be shipped prepaid by the Contractor and the Contractor shall give the Employer advance notice in written of all items shipped.

3.17.18 Assembly marking

All parts, or units of shop assemblies, shall be marked, or tagged with piece marks. Marks shall be in accordance with approved erection drawings, shall be clearly legible and so placed as to be readily visible when the part is being erected in the field. Before dismantling for shipment, connecting parts assembled in the shop shall be match marked to facilitate erection in the field and marked so as to identify each part with the assembly to which it belongs. The location of the match marks shall be clearly indicated on erection drawings. All parts or assembly of parts shall also be so marked as to identify them with this Contract.

3.17.19 Quality of design, materials and manufacture

All items of the Plant shall be designed and manufactured in the most sound manner, using materials most suited to the particular service and giving due consideration to the most recent technical advances. All materials and components shall be new and unused. The design and materials shall be such as to enhance service life, operational reliability, freedom from wear and tear and ease of maintenance, inspection and adjustment.

3.17.20 Quality assurance and quality control

3.17.20.1 Introduction

The quality assurance programme and quality plan have been described in previous paragraph related to quality assurance programme and quality plan for all the works.

3.17.20.2 Test program

The Contractor's test program shall be suitably documented to assure that the required components or sub-components testing are properly performed. The test program shall address pertinent test pre-requisites, such as test instrumentation selection and calibration, acceptance criteria, documentation of test results, and evaluation of test results by qualified personnel.

3.17.20.3 Level of criticality and control

The level of quality control shall be adjusted to the importance of the equipment in terms of cost of repairs, personnel safety and loss of production as applicable. In respect of inspection and approval, the levels of criticality of the equipment and phases of construction will be divided into three categories as follows:

- Type R (R for Record) The Contractor shall send to the Employer the record of the tests or inspections. This generally applies to items whose failure would have no effect on production, personnel, ecology or environment. Replacement of equipment or spare parts would be readily available and treated as routine maintenance.
- Type I (I for Invitation) The Employer shall be invited to be present during the tests or inspection and the Employer will decide whether to assist in the tests and to inspect the works or not. If the Employer decides not to be present, the works will go on.
- Type S (S for Stop) The works (manufacturing, erection, placing, construction, testing) shall be stopped and the work shall be resumed only after the Employer has given his approval. This generally applies to those items whose operability and reliability is vital for operation. Shutdown due to

malfunction or failure of one of these items would result in loss of production and/or replacement costs, or pose potential hazard to personnel safety, and could cause damage to the environment.

3.17.20.4 Non-conformity

During manufacture and site works, after each assessment or measurement of quality, cases of non-conformity (NC), identified either by the Contractor's quality control supervisors or by the personnel in charge of execution or by the Employer, will be divided into four categories:

- NC.1 Minor defects which shall be repaired immediately, then recorded on standard follow-up documents.
- NC.2 Defects which can be repaired according to a pre-established procedure. The repairs shall be carried out immediately and recorded on special documents.
- NC.3 Defects which cannot be repaired according to a pre-established procedure. The decision to repair, modify or rebuild or remanufacture the item shall be proposed by the Contractor for the Employer's approval.
- NC.4 Main defects on critical items. The Contractor shall propose a solution to the Employer. Then the Employer, after due consultation, will notify the Contractor of the final decision.

3.17.20.5 Documentation

The Quality Plan shall include a system to ensure that the documentation necessary to verify the completion of fabrication, erection, and installation, use of correct material ; completion of required inspections and tests and acceptability of results are generated, reviewed, maintained and issued to the Employer at the required time.

The system shall ensure that such documentation is reviewed by the Contractor for legibility, completeness, validity of data, traceability of document to activity or equipment and acceptability of results

Documentation to be generated and maintained during manufacturing and site works period as applicable, shall include at least:

- Raw material test report (mechanical, chemical, radiosopic, etc.) as per Standards. In the case of materials for which such practice is usual, the Employer may accept the Contractor's certified mill and laboratory certificate.
- Weld and weld repair procedure
- Inspection and test procedures
- Inspection and test reports
- If a demonstrable satisfactory service record is available for a material, certain specified tests may be waived by the Employer
- Vendor surveillance reports
- Heat treatment records
- Final inspection reports
- Packing and shipping procedure
- Certificates of compliance

In the case of Standard labelled stock products which have a record of satisfactory performance in similar works over a period of not less than 2 years, the Employer may accept a statement from the Contractor and verified by a certified laboratory certifying that the product conforms to the applicable specifications

3.17.21 Inspection and tests

The whole of the Works is subject to inspection and test by the Employer during manufacture, installation and completion at the Site where such tests or inspections are required in the Employers Requirements, or when it is impossible to certify that the performance conforms to the Employer’s Requirements

The Employer shall be given the opportunity to witness all tests, and the Contractor shall give adequate notice of all tests to be carried out, at least 8 weeks prior to scheduled tests.

The approval of the Employer or the passing of any inspection or test shall not prejudice the right of the Employer to reject equipment or material if it does not comply with the Specification when installed or incorporated into the Works.

The Contractor shall submit a "Quality Control, Inspection and Test Plan", which shall describe the inspection and test procedure containing acceptance criteria for each component.

If any component fails under test, such further tests, which are considered by the Employer to be necessary, shall be carried out by the Contractor as per GC 23 Test and Inspection.

3.17.22 Workshop inspection and tests

As far as practicable the quality of materials, workmanship and performance of all items and equipment to be furnished under the Contract shall be inspected and tested at the place of manufacture.

Factory tests shall be made by the Contractor on the following items:

- Towers
- Conductors
- Earth wire/ Ground Wire
- OPGW
- Insulators
- Line hardware/fittings

- Other equipment (joint boxes, aircraft warning spheres)

3.17.23 Testing and Commissioning

The Contractor shall carry out the site/field tests as per the Specifications and the approved program which may be adjusted, when so directed by the Employer, according to the actual conditions prevailing on site. They include:

3.17.23.1 Tests and Checks prior to Pre-commissioning

In the course of erection of each item of the equipment:

- Before grouting into concrete, the embedded parts of the equipment shall be inspected and checked by the Contractor. After approval of these parts by the Employer and after formal authorisation the grouting will proceed.
- After grouting, the Contractor shall check that those parts of equipment have not moved beyond the acceptable tolerances and shall report timely to the Employer if any damage/movement has occurred.
- Before stringing, the attenuation of each fibre of the OPGW, of each drum will be checked, in order to confirm the factory tests. If a drum is not compliant, it will be rejected.
- Before sealing a junction box, the attenuation of the joint will be checked. If a joint is not compliant, it will be made again.
- Upon completion of the transmission line construction, the Contractor shall carry out final checking and testing works

The Pre-Commissioning checking and testing shall include but may not be limited to:

- Finalisation of all pending works;
- Tightening of bolts and fixing of missing members to towers;
- Remove all scaffolds and equipment and clear all debris and other rubbish from the site;
- Restore surface damage, foundation subsidence and carry out erosion control measures, where directed by the Employer or as required by local authorities or regulations;
- Remove all left-over materials (if not needed by Employer) at winch yards, drum yards and store yards;
- Complete danger tree clearing and tree re-clearing on the easement;
- Check phase sequence plates on both sides of all points of the line;
- Measurement of the OHL parameters (random measurement of sag, spans, clearances, as indicated by the Employer)

On completion of the works and before commissioning, the Contractor shall carry out electrical tests under the supervision of the Employer, the list includes but is not necessarily limited to the following:

- Measurement of phase coincidence to confirm phase sequences and transpositions
- Measurement of insulation level
- Measurement of line resistance in direct current
- Measurement of line resistance (impedance and capacitance) in alternating current
- Measurement of the working reactance and impedance
- Measurement of the earth phase reactance and impedance
- Measurement of the direct capacity
- Measurement of the resistance of the earthing point on each tower
- Measurement of the zero-sequence capacitance
- OPGW tests. The OPGW shall be tested continuously together with the joints attenuation.

Line Inspection and Punch List compilation

On completion of the works, a final inspection of the line will be conducted in the presence of the Employer and the Contractor. On this occasion the towers and their assembly will be inspected and the presence of such items as name plates/labels, the earthing point clamping devices, etc. will be verified. The Employer’s Project Manager will prepare a list of minor defects and omissions (Punch list) will be issued to the Contractor to begin repairs immediately after receiving the same.

Notification of Pre-Commissioning Tests

Upon successful completion of final inspection of the line, the Contractor shall, in accordance with the Contract, notify the Employer that the works are ready for Pre-Commissioning and the Pre-Commissioning Tests will then take place.

3.17.23.2 Pre-Commissioning Tests

Documentation

No later than 14 days prior to the commencement of the Pre-Commissioning tests, The Contractor shall provide to the Employer .

Tools, appliances and spare materials required for maintenance of the transmission line as detailed in technical specifications

- All outstanding drawings and documentation to be provided under the Contract
- The Operating and Maintenance Manuals

Training

No later than 7 days prior to the commencement of Pre-Commissioning Tests, the Contractor shall provide training during one full week (5 working days) the Employer's staff to the extent where they are fully familiar with the technical aspects and the operation and maintenance requirements of the transmission line and its auxiliaries and that the duties can be assigned to the trained personnel on completion. Training shall include live line working.

The Tests

Upon receipt of all materials, tools, appliances, manuals and drawings, the Contractor will commence with the following tests and checks:

- Seven (7) day soak test

The Employer will energise the line for pre-commissioning tests.

During the Soaking Test the Contractor shall carry out all necessary tests and checks to demonstrate that the transmission line operates at the specified voltage levels and complies with the specification.

The soak test shall demonstrate the operational reliability to the extent that the transmission line is able to operate at full voltage and partial load prior to availability of full load conditions from the Power Plant. The soak tests will be undertaken without interruption caused by a line fault attributable to defects in the Contractor's supplied material or workmanship for the 7 day soaking period. In the event of an interruption from a cause not attributable to the Contractor, the 7-day test period shall be paused and resumed once the line is restored.

The following additional tests and checks will be carried out during the same 7 day soak test period;

- Multispectral Aerial Inspection of whole transmission line (Infrared thermal inspection, UV Inspection for Corona and Partial Discharges Detection and Visible Spectrum Inspection)
- Digital video of the entire aerial inspection
- Report of every anomaly detected during the inspection
- Digital visible/UV light photograph, colour thermogram and grey spectrum thermogram images
- Complete analysis of the anomaly (either thermal, UV or visible)
- GPS locations of the anomalies

Pre-Commissioning Test Report

Upon successful completion of the Pre-commissioning Tests and Checks, The Contractor shall produce a Pre-Commissioning report will include the measures proposed by the Contractor for correction of all anomalies. All tests/checks shall be described in detail and will be accompanied by all the relevant results, tables, charts and graphs, etc. The report shall be amended to a comprehensive record of all settings and final adjustments made during the pre-commissioning and commissioning of the transmission line.

After Employer's approval, the Punch List will be updated to include all anomalies and the Contractor will perform all necessary rectification works at its own cost and within a period of time to be agreed with the Employer

Completion

Subject to the provisions of sub-clause 24.5 of the Contract, the Employer shall issue the Completion Certificate.

3.17.23.3 Commissioning Tests

Upon successful completion of the Pre-Commissioning tests, Commissioning tests will be scheduled by the Employer within the period prescribed in the Contract which will include running tests under live conditions with voltage, etc. in order to check the correct and reliable operation of the line. The Commissioning Tests will be as follows;

- The Employer will notify the Contractor when full load conditions for the evacuation of power from the power plant will be available on a continuous basis.
- Commissioning shall energize the lines in stages, starting from [Kasama] S/S and progressing to the Tanzania border. Tests shall be at operating voltages (330kV for all lines initially) and include load flow verification. The energizing shall follow ZESCO new equipment commissioning procedures. However, the Contractor will provide the methodology and sequence of commissioning for approval by the Employer.
- As a minimum, the procedure shall include:
 - verification that the 132 kV design performance requirements are maintained during initial 66 kV operation;
 - inspection and testing of the loop-in/loop-out interfaces, including jumpers, terminals, and conductor/OPGW tie-ins;
 - confirmation of correct phasing, continuity, insulation clearances, and earthing;
 - coordination and verification of protection settings with the existing 66 kV system
 - energization and functional tests at the initial operating voltage of 66 kV; and
 - defined acceptance criteria and submission of test records for Employer review.
 - coordination and configuration of Telecommunication settings with the existing Isoka-Nakonde town network.
- The transmission line will be operated by the Employer and witnessed by the Contractor for a 14 day period during which time the line will be operated at full voltage and maximum power plant load without interruption arising from line faults.
- Upon successful completion of the Commissioning Test(s) the Employer will issue an Operational Acceptance Certificate to the Contractor.

3.17.23.4 Final inspection

Within 30 days before the expiry of the Defects Notification Period, the Employer may request the Contractor to inspect any part of, or all of the transmission line. The Employer will provide the labour for this task to work under the direct supervision of the Contractor.

The cost of the supervision as well as the costs of the Employer’s labour used in making good any defects uncovered during the inspection will be to the cost of the Contractor.

Installation / Erection Manual and Drawings

The Contractor shall provide the Employer with an Installation and Erection Manual covering installation and erection procedure and instruction to facilitate smooth erection, assembly and testing on site of the transmission line and its component to be installed.

The instructions therein shall specify the exact procedures to be followed during installation and erection, indicate data to be measured and recorded (adjustments, setting of limits, sags, etc.), quantities, dimensions and tolerances to be checked, etc.

The manual shall include information for handling and slinging the major pieces of transmission line structures and line hardware, erection tolerances, settings and adjustments and special precautions to be taken during installation.

The Contractor shall submit one hard copy and E-copy of the Installation and Erection Manual for each distinct part of the Works to the Employer.

Commissioning Manual

The Contractor shall provide the Employer with a Commissioning Manual, which shall be similar in size and form to the Installation Manual and shall include procedures and instructions to be followed during the commissioning of all equipment to be installed.

The instructions therein shall specify the exact procedures to be followed during commissioning of the transmission line and shall indicate all data to be measured (and where appropriate recorded in the manual itself) and all adjustments, setting of limits, sagging, tower grounding resistance, etc., quantities, dimensions and tolerances to be checked.

The Contractor shall submit one hard copy and E-copy of the Commissioning Manual for each distinct part of the Works to the Employer.

Operations and Maintenance Manual

The Contractor shall provide the Employer with an Operation and Maintenance Manual similar in size and form with the other manuals and shall include procedures and instructions to be followed by the operating and maintenance staff necessary for reliable operation and maintenance of the transmission line.

The manual shall contain at least the following documents and data:

- General description of the tower, line hardware and materials;
- Main technical characteristics;
- Interconnection of each complete assembly drawings of suspension insulators and hardware;
- Instructions for transmission line maintenance personnel including periodic tests, check-points, actions required following each trip out of the line during lightning strikes and over voltages;
- Summary of important rules, standards, safety precautions and instructions to be followed during line maintenance, both off-line and on-line maintenance;
- Safety and warning signs to be placed in the tower structures;

Sections on "maintenance" shall be divided into two parts, namely:

- Current (preventive) maintenance indicating inspection periods, routine cleaning and live line washing (if required) procedures, safety checks, adjustments, etc.,
- Repairs describing the dismantling, removal and replacement of parts (with spare parts), trouble-shooting guides, repair instructions, etc.,

The Operation and Maintenance Manual, supplemented by any additional drawings and project documents to be submitted to the Employer will be the only document to be generally used by the transmission / substation operating staff.

The Contractor shall submit one hard copy and E-copy of the Operation and Maintenance Manual for each distinct part of the Works to the Employer.

3.18 Environmental and Social Management Requirements

An Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Management Plan (ESMP) have been prepared in respect of the proposed transmission line route and Environmental and Social Requirements - ESS should be in full - Environment and Social Standards derived from the World Bank Environmental and Social Framework 2018.

The Resettlement Action Plan (RAP), ESMP, ESIA, LMP, SEP, ESCP, GRM instruments for the project shall be provided as appendices. Copies are also available with ZESCO for inspection by Bidders to provide information and guidance in the preparation of their bids and duly inform themselves of environmental and social protection requirements to be taken into consideration and implemented in mitigation of impacts of transmission line construction in conjunction with Environmental Protection measures summarised in sub-section 3.19 below. Detailed environmental and social protection requirements are specified in Section 12 of this document and the project ESIA and ESMP.

The Contractors shall be expected to prepare a Contractor’s Environmental and Social Management Plan (C-ESMP) within 30 days after contract effectiveness.

All works are required to comply with the environmental and social requirements in the World Bank ESS and the specific measures provided in MoE’s Social Safeguard Framework and shall be operationalized through the Contractor’s ESMP (C-ESMP). Key responsibilities, to be spearheaded by the Contractor’s Social and Gender Expert, shall include but not be limited to implementation of tasks related to working conditions and equal employment opportunities, prevention and referral of SEAH and HIV/AIDS cases, community engagement, social awareness trainings, including toolbox talks and induction, as well as internal social and gender audits (also covering sub-Contractors) and management/referral of grievances in liaison with the GRM focal point. As part of the monthly reporting to the Owner’s Engineers, the Contractor shall monitor and report on agreed social and gender key performance indicators, including employment quotas.

The Contractor, via an external Anti-GBV service provider approved by the PIU, shall provide free Voluntary Counselling and Testing (VCT) and referral services covering HIV and other STIs and TB on a quarterly basis, make available condoms, identify and train peer educators and conduct specialized trainings on SEAH and HIV/AIDS bi-monthly at site and project-affected communities. The service provider should be mobile and have the capacity to provide on-site immediate care and basic medical interventions, including administering Post-Exposure Prophylaxis (PEP), emergency contraception (EC) within the required 72 hours window in situations where this cannot be accessed at the OSCs or local health clinics due to long distances or lack of resources. The service providers will also support the Contractor and GRM Focal Point in assessing GBV related risks, identifying cases of GBV and manage referrals. All GBV-related grievances reported to the GRM committee will be managed by the Anti-GBV Service Provider (ranging from comments and jokes of sexual nature to rape and requests for sex in exchange for jobs).

The Contractor must consider the very sensitive Euphorbia area at Mwela Rocks, where minimised tower footprints are required. Furthermore, the Contractor have to carefully survey and plan the access paths in this area to avoid any interference with the Euphorbia. See Appendix 2 for a preliminary survey report and assessment of the Euphorbia.

An Environmental Permit for the Project has been issued by Zambia Environmental Management Agency (ZEMA). A copy of the Permit is included within Section 14 of this document.

The regulator in Zambia is Zambia Environmental Management Agency.

3.19 Environmental Protection

The Contractor shall be required to comply with all local and international laws and regulations applicable to the project area with respect to environmental and social aspects and conditions as described in the ESIA and ESMP and as set out in the Environmental, Social, Health and Safety Specification (ESHS) and Environmental Permit, refer to Section 0,

ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY SPECIFICATION (ESHS) of this document.

The Contractor shall prepare and implement a Worksite Contractor’s Environmental and Social Management Plan (C-ESMP) 30 thirty days of contract award which shall comply with the requirements of the above documentation, and which includes, but is not limited to, details on the following:

ESHS organisation, resources and facilities

ESHS training of local staff /partners and sub-Contractors

Worksites description (including associated site access roads, base camps, borrow pits, storage areas)

Traffic management

Control of hazardous substances

Control of wastewater (effluents)

Prevention of erosion and sedimentation control

Control of atmospheric emissions including noise and dust

Protection of native fauna and flora

Waste management procedures

Site rehabilitation and re-vegetation

Control of infectious and communicable diseases (HIV/AIDS, malaria...)

Prevention of accidents to local community and damage to their property

Local recruitment and relations with local community

Grievance Redress Mechanisms

For each of the identified Worksites, the Contractor is also required to prepare a Site Environmental Protection Plan (SEPP). The list of sites subject to the preparation of a SEPP is to be validated by the Engineer. The SEPP(s) are to be provided as annexes to the C-ESMP.

The SEPP should include the following information:

a general description of the site and it’s setting with location plan drawn to scale;

a set of site specific protection measures and an implementation programme;

description of local health infrastructure and access in case of emergency;

specific site regulations on environmental protection and security; and

rehabilitation / restoration plans at the end of works.

In particular, the Contractor shall note its implementation of the above C-ESMP (and SEPPs) and its requisite activities will be monitored directly by environmental officers within the Employer’s Project Implementation Unit under the supervision of the Employer and subject to an external Environmental Review and Audit from the Employer.

The Contractor shall be responsible for all approvals required from government authorities and agencies for his operations and to carry out all remedial work.

The ESMP that will be prepared by the Contractor should be followed to the letter especially on the grievance mechanism of workers and communities are to be included. The World Bank standards will have to be adhered to.

3.20 Site and Operational Health and Safety for Personnel and Equipment

The maximum safety, consistent with good erection practice, must be afforded to personnel directly engaged on this Contract, or who in the normal course of their occupation find it necessary to utilize temporary works erected by the Contractor or frequent the working area. Reasonably practicable measures shall be taken to afford adequate protection against material falling from a higher level onto personnel below.

Particular care shall be taken during work at places where the line runs parallel to other lines that may be energized.

The Contractor and his representatives shall in all ways comply with Employer’s Safety Rules regarding electrical apparatus and the safety of staff working thereon. The Contractor shall develop, prepare and communicate a Safe System of Work for all activities under their control, including works of sub-Contractors and suppliers.

In addition to the reports which the Contractor may be required to file under the law, they shall also file with the Employer, on or before the tenth day of each month, a report giving the total labour force employed in Zambia, in man-days, during the previous calendar month, and the number and character of all accidents resulting in loss of time and any other information on the work and disabilities arising there from that may be required by the Employer.

During the erection phase the Contractor shall permanently employ an employee that is qualified in safety and is familiar with the type of work being performed, whose assignment shall include initiation of measures for the protection of health and the prevention of accidents and who shall see, by personal inspection, that all safety rules and regulations are enforced.

No testing or other work on apparatus which has been delivered to Site and which is liable to be electrically charged from any source shall be permitted except under a “Permit to Work” which will be issued for the purpose by ZESCO’s Operating Engineer.

At the completion of the Contract Works the Employer shall undertake an inspection to ensure the operational safety of the overhead electricity transmission line. For this purpose, the Contractor shall jointly undertake with the Employer an inspection of the Contract Works. The cost of any re-inspection occasioned by non-compliance with the Specification by the Contractor shall be borne by the Contractor.

The Contractor shall develop and maintain a Health and Safety Management Plan (HSMP) that shall outline the site and operational safety of all employees and equipment. The HSMP shall establish, document, implement, maintain, retain, and aim to continually improve site operations in accordance with the requirements of the ZESCO SHEQ File, extracts from the ISO standards (ISO45001 and ISO 9001), relevant Social Safeguards Standards (SSS), ‘ESS2’ and ‘ESS4’, EHS guidelines and in compliance with the relevant Zambian Legislation and ZESCO standards. All applicable legal requirements must be adhered to, even if not listed specifically in this HSMP. This shall be consistent with the requirements prescribed in the ESIA and ESMP documents, respectively, in addition to any other relevant guidelines.

The HSMP shall describe how the Contractor intends to satisfy all its obligations to manage and coordinate the operations during the construction phase. The HSMP documentation shall include policies, leadership and commitment, key process documents, forms, registers, and reports.

This information is provided to serve as a guide to the Contractor(s) involved in fulfilling specific construction obligations on this project to help regulate, prevent, and minimize the risks that may cause possible losses of life of personnel, damage to property and equipment, time, money, and loss of reputation.

The Contractor will put in place measures that will provide safety precautions for every identified hazard and ensure proper dissemination of safety information to everyone who will be exposed to critical activities.

It shall be the responsibility of the Contractor to clearly define the roles and responsibilities of the supervisors and employees as well as outline clear and objective safety enforcement action plans through, but not limited to, the following:

Information sharing (e.g. site rules)

Provide initial information on site conditions at the pre-qualification stage. As the project develops, there will be a requirement to ensure that all workers are aware of the site rules and hazards by means of site inductions and retaining records of those trained.

Hazard reporting

The need and duty of the Employer (ZESCO) to cooperate and ensure that they clearly communicate the hazards of the site to the Contractors, and that Contractors in turn communicate the hazards associated with works that they are carrying out. If an uncontrolled hazard is identified on site, there must be a suitable communication mechanism to highlight this to the two parties (Client and Contractor).

Control of access to hazardous areas

The construction area should be fenced off or clearly indicated at the perimeter with the right and approved signages.

Emergency procedures

Provision of emergency procedures, as per legal requirement or essential best practice. This will generally include fire, First-Aid provision, as a minimum, in addition to any other perceived emergencies specific to the site. The procedures must also include the means by which the site will communicate with the emergency services.

Safe Systems of Work (SsoW)

All work earmarked to be carried out at each site must be in accordance with a Safe System of Work (SsoW) drawn up by competent persons. For high risk operations such as work on complex processes requiring isolations, confined space work, and work on electrical equipment (especially high voltage), arrangements must be made with ZESCO to execute them under their usual Permit to Work system.

Assessment of exposure to hazardous substances

Where hazardous substances are present on-site, it shall be the responsibility of ZESCO to ensure that this is clearly communicated to the Contractor and suitable controls implemented. Where the Contractor uses hazardous substances (such as floor laying adhesives or epoxy paints), etc., the Contractor shall ensure that the hazards and risks are controlled to protect both their employees and anyone else who could be affected. In both situations the control would be achieved through the use of effective risk assessment programs.

Sign in/sign out

There is a clear need to know who has access to the site and who is present on-site at all times.

Active monitoring

The Contractor shall be required to take a pro-active stance towards prevention of foreseeable losses through active health and safety performance monitoring of operations and subsequently devising of effective preventive measures and action plans. This works in tandem with active hazard reporting, behavioural safety observations, safety tours, and audits.

Assessing the number of incidents and special arrangements

The need to monitor reactive events such as incident statistics, the reporting and investigation of accidents, and the subsequent documentation of ‘Lessons learned’ remains essential to the prevention of future incidents. Accident investigations should be carried out and the findings communicated appropriately throughout the project.

Furthermore, these regulations to comply with the safety requirements set out by the main Contractor shall trickle down to all the sub-Contractors that may be engaged to operate in any other sites covered by the main Contractor.

Contractor shall refer to the ESIA and ESMP of the project.

3.21 Work in Energized Area

When the work involves modifying or extending an existing substation and where the workers will access energized areas of the switchyard, the Contractor shall present to the Employer a detailed work plan where the Contractor explains the method they will be using to perform each operation. The Employer will coordinate with the operator of the energized area to obtain the permit for the Contractor to access the area and, when necessary, to put the corresponding section of the area out of service with a warning sign **“Work on energized parts is strictly prohibited”**.

The Contractor will be responsible for implementing safety measures when operating in energized surroundings. Such measures may include the use of temporary barriers with padlocks, warning signs, grounding tools, coloured tape to limit the zone, etc. These measures shall be agreed with the Employer and the operator of the energized area.

3.22 Security

The Employer will, if required, specify overall security requirements for the Project. The Contractor shall conform to such requirements and be responsible for the actions of their personnel in respect of such requirements.

The Contractor shall ensure that all employees, representatives and subcontractor’s employees wear identification badges, provide such badges and ensure that badges shall be worn all times that employees are on site.

The Contractor shall be responsible for the security of his own work, work areas, store, offices and the like.

3.23 Planning and progress reports

The Contractor shall submit for review, within 4 weeks of the starting date of the Contract, an outline design, manufacture, delivery, construction and erection chart. Within a further period of 4 weeks the Contractor shall provide a detailed programme in a format to be agreed by the Engineer; this programme shall also include details of drawing submissions.

The Contractor shall submit to the Employer at monthly intervals, not later than the seventh day of the following month, and in such formats as may be required by the Engineer, detailed progress reports of the status of design, material procurement, manufacture, works tests, delivery to Site, erection of all plant and materials included in the Contract, testing and commissioning with regard to the agreed contract programme.

Reports shall include a chart detailing plant manufacture, delivery and erection. The chart shall indicate all phases of the work with provision for modification if found necessary during execution of the Works.

The design aspect of the progress report shall include a comprehensive statement on drawings and calculations submitted for review.

The details on material procurement shall give the dates and details of orders placed, indicating delivery dates and expected inspection dates quoted by the manufacturer. If any delivery date has an adverse effect on the contract programme, the Contractor shall state the remedial action taken to ensure that delays do not occur.

The section on manufacture shall indicate dates of arrival of material, the progress of manufacture and testing and shall state the date on which the material will be ready for transport. Any events which may adversely affect completion in the manufacturer’s works shall also be reported.

All works tests and the test results shall be listed, and a commentary provided. Any test failures shall be explained, and the Contractor shall state his proposed actions to prevent delay to the project completion.

The shipping or transport of each order shall be monitored in the progress report and shall give the date when equipment is available for transport, the expected time of delivery to site and the dates actually achieved.

The report on the site works shall be subdivided into each of the activities included in the detailed construction programme and each activity shall be monitored giving work achieved, the percentage completion and estimated completion dates for each activity, in accordance with the contract programme. The number of personnel working on site, both labour and supervisory staff, shall be reported together with any incidents or events that may affect the progress of site works. The progress reports shall include photographs of work items of interest and any unusual form of construction or foundation work.

A site weekly programme of work shall be provided each week during the previous week.

Any delays which may affect any milestone or completion date shall be detailed by the Contractor who shall state the action taken to effect contract completion in accordance with the contract programme.

The Contractor shall forward two copies of each progress report to the Employer. If during the execution of the Contract the Employer considers the progress position of any section of the work to be unsatisfactory the Employer shall be at liberty to call progress meetings at site or in his office with a responsible representative of the Contractor.

3.24 Erection, supervision and checking of work on site

The carrying out of all work on the Site included in this Contract shall be supervised throughout by a sufficient number of qualified representatives of the Contractor who have had thorough experience of the erection and commissioning of similar Works.

Type test records and certificates provided by the Contractor for material and equipment may be accepted, provided that those records and certificates are not older than eight years and tests were carried in accredited laboratory.

The Contractor shall ascertain from time to time what portions of the work on the Site the Employer desires to check, but such checking shall not relieve the Contractor from the liability to complete the Works in accordance with the Contract or exonerate him from any of his guarantees.

The Contractor shall maintain an operational **Daily Construction Logbook** for each construction site (under separate control or site office).

This Logbook will reflect and register at least, but not limited to, the following data:

- i. all construction activities on respective site
- ii. delivery of material
- iii. number of staff on site
- iv. temperature and weather conditions
- v. minor operational design changes
- vi. sagging data (if applicable)
- vii. site measurements undertaken
- viii. site tests undertaken and their results, if applicable
- ix. record of daily H&S briefings and procedures

- x. details of any HSE incidents which occurred in the review period

This logbook shall be submitted to the Employer in one (1) original plus two (2) copies on a weekly basis. The Employer will then return the signed original to the Contractor with remarks/comments or with the status “NOTED”.

If at any time it appears to the Employer that the Contractor will be unable to complete any Section of the Works in the time stipulated, then the Contractor shall, if required by the Employer, carry on such work outside normal working hours and shall not make any claims for any extra expense thereby incurred unless, in the opinion of the Employer, the delay is due to causes for which the Contractor would be entitled to an extension of time under the Conditions of Contract.

The Contractor shall satisfy himself as to the correctness of all connections made between the apparatus supplied under the Works and apparatus supplied under any other contract before any of the former is put into operation.

If the Employer shall certify that defects have shown themselves in the Works, the Contractor shall, for the purposes of maintenance after the completion of the Works provided for by the Conditions of Contract, keep on Site, supervisory staff of such numbers and for such periods as the Employer may require.

The Contractor is to keep the site, on which he erects or stores plant, reasonably clean removing all waste material resulting from the Works as it accumulates and as reasonably directed. On completion of the Works the Site is to be left clean and tidy to the satisfaction of the Employer. Any damage done to buildings, structures and plant or property belonging to Employer is to be made good at the Contractor’s expense.

Detailed Drawings, Design and Specifications

Before proceeding with the manufacture of equipment, the Contractor shall submit corresponding detailed drawings, designs, and detailed specifications (in typewritten hardbound form) which shall show all details of materials, manufacture, assembly, testing, erection, commissioning, operation and maintenance of the equipment in conformity with the Contract requirements.

The detailed drawings and specification shall include, but not necessarily be limited to the following:

- General assembly drawings;
- Assembly drawings, showing:
 - sectional views,
 - details of mounting of the materials and hardwares,
 - function of the assemblies,
 - adjustment and operating ranges,
 - concrete pedestals and foundation bolts and anchors,
 - field tolerances,
 - all field joints,
 - methods of lubrication (if required)
- Detail manufacturing drawings showing:
 - detail dimensions
 - tolerances
 - materials
 - nameplate diagrams
- Engineering instructions and detailed specifications for:
 - manufacturing
 - fabrication
 - painting, including final colour scheme
 - heat treatment
 - welding
 - surface treatment and
 - testing

Design Computation and Final Design Data

After the Contractor has completed the preliminary design of the transmission line structures, he shall submit the final design data, design analysis and design computations (referred to as designs) along with all other specified designs and studies, all in one hard copy and one e-copy, clearly laid out with all the design criteria and standards indicated for Employer's review and approval.

The design calculations which may be presented under existing computer forms shall include in particular:

Title page:

- Title of the calculation note;
- Document number and date;
- Revision number and date;
- Name of the designer;
- Name of the verifier;
- Name of the project ;
- Name of the client ;
- Name of Contractor;
- Name of supervising Project Manager;
- Name of Employer;
- Format of the document (A1, A2, A3 or A4);
- Scale (if relevant).

Content:

- Calculation conditions and description of the hypotheses and Standard used;
- The values of the maximum stresses under normal and exceptional operating conditions and during handling, transport and erection;

- The main dimensional characteristics;
- The properties of the materials used;
- Bibliographical references used for the calculations.
- The loads to which the supply is subjected and their origin; o the forces transmitted to supplies and to the foundations;
- Stresses to which the equipment will be subjected under normal and exceptional operating conditions (including handling, transport and erection);
- The permitted safety factors;
- In general, any indications required for a proper understanding of the design of the supply;
- All variables used in the calculations must be clearly identified;
- Tower outline drawing: tower outline with all members clearly identified, dimensions, members size, bolt type and size, weight, electrical clearance, leg configuration, body extension and crossarms.

Attached

- Computer files used to produce the calculation note (ex: excel file, pls-tower file, pls-pole file, pls-cadd file, .kmz file of the line, etc.
- All drawings must be submitted both in PDF and AutoCAD in the appropriate format (A0, A1, A2, A3 or A4).

File name

- The file names must be made up of the document number + Revision number;
- Non-identical files cannot share the same name.

The design calculations shall be sent with the drawings: no equipment drawings shall be approved until the Employer has the design calculation for that supply. For any item of equipment, partial design calculations may be submitted to the Employer depending on the various stages of execution of drawings (for example, grouting drawings, built-in parts, structures, operating devices, etc.).

A complete set of design calculations for each item of equipment shall be given to the Employer on completion of the execution drawings for the item of equipment in question.

The Employer reserves the right, during the design period, to request the Contractor for any additional design calculations which he considers necessary.

3.25 Language, weights and measures

The English language shall be used in all written communications between the Employer and the Contractor with respect to the services to be rendered and with respect to all documents and drawings procured or prepared by the Contractor pertaining to the work.

Whenever anything is required under the terms of the Contract to be marked, printed or engraved, the English language shall be used except where otherwise provided in the Specification.

The design features of all equipment, all quantities and values which are required to be stated in the Technical Data Sheets and all dimensions on drawings, whether prepared by the Contractor or not, shall be stated in the International System of Units (SI).

3.26 Packing and shipment

The Contractor shall be fully responsible for all aspects of transport, packing etc.

The responsibility shall lie with the Contractor whether the dimensions of his supplied equipment and materials in crate or in box will be appropriate for loading, unloading and transportation to the Site.

The Contractor must at his own expense, conduct a visual route survey of all roads, bridges, overpasses, etc. from the Port of Entry to the Site and examine for himself the conditions of all roads and bridges.

The Contractor shall check the capacity and availability of loading and unloading facilities, which will be utilized in connection with his transport operation, as well as its characteristics, taking appropriate measures to avoid damaging the same. All costs related to the reinforcement of roads, bridges and the like, if any, should be borne by the Contractor.

The Contractor shall co-ordinate his own transport program and shall advise the proper authorities of the transit of the heaviest items to be transported and shall comply with the instructions given by said authorities.

All materials shall be carefully packed for transport by sea, rail and road and in such a manner that the packing provides adequate protection against all climatic conditions experienced in transit and storage on site during the construction period.

The whole of the materials shall be packed where necessary in non-returnable cases or on non-returnable drums or otherwise prepared for overseas shipment in a manner suitable to withstand rough handling without sustaining damage.

Bundles of steel angle sections shall be properly tied together by an approved method and care taken to ensure that they are robust and not of excessive length for handling during shipment.

The Contractor’s attention is drawn to the provision of the Specification wherein the Contractor is required to suitably protect all steelwork before shipment to prevent damage to galvanized surfaces by white rust.

Packing cases where used shall be strongly constructed and the contents shall be securely bolted or fastened in position with struts or cross battens. Cross battens supporting weight in any direction are not to rely for their support on nails or screws driven length wise into the grain of the wood but are to be supported by cleats secured from the inside.

Bolts and nuts shall be crated for shipment.

Crating together of components of dissimilar metals is not acceptable.

Particular attention shall be given to strutting before packing cases are fastened down. Cases shall be upended after packing to prove that there is no movement of the contents.

Timber wedges or chocks shall be firmly fastened in place to prevent their displacement when the timber shrinks.

Where bolts are used, large washers shall be fitted under the head and nut to distribute the pressure, and the timber shall be strengthened by means of a pad.

All stencil marks on the outside of the casings shall be either of a waterproof material or protected by shellac or varnish to prevent obliteration in transit.

Wood wool shall be avoided as far as possible.

Waterproof paper and felt linings are to overlap at seams by at least 12mm and seams shall be secured together in an approved manner, but the enclosure is to be provided with screened openings to provide ventilation.

Each crate or package shall contain a packing list in a waterproof envelope. All cases, packages, etc. should be clearly marked on the outside to indicate the total weight, show where the weight is bearing, the correct position of the slings and to bear an identification mark relating to the appropriate shipping documents.

Loading and off-loading of reels and drums shall be performed in such manner to assure the reels or drums are not damaged. Any damaged reel or drum shall not be accepted and returned.

The Employer may be required to inspect and review the packing before items are despatched, but the Contractor is to be entirely responsible for ensuring that the packing is suitable for transit and such inspection will not exonerate the Contractor from any loss or damage due to faulty packing.

The Contractor shall prepare equipment for shipment to protect it from damage during shipment and subsequent storage not exceeding one year.

Equipment shall be completely drained of all water and thoroughly dry prior to shipment. When such draining requires removal of plugs, drain valves, etc., the Contractor shall make sure that these parts are reinserted or reassembled prior to shipment.

All openings and machined surfaces shall be provided with protection to prevent damage, corrosion and entrance of foreign matter during shipment and storage.

Flanged connections shall be protected by a 12.5 mm or thicker plywood disc, or suitable alternate, bolted to the face of the flange.

Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast-iron plugs are not acceptable for protection unless part of the permanent assembly.

Wooden disks that cover the entire weld end area and are secured by metal straps and fasteners shall protect butt weld connections.

Covers, straps or fasteners shall not be welded to equipment.

Equipment shall be adequately supported for shipment. All loose parts shall be crated or boxed for shipment and appropriately identified. If equipment is braced internally for shipment, it shall be marked conspicuously, "Remove internal braces before testing and operating".

All large and heavy shipping units shall have suitable skids for moving. Crating shall also be adequate for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.

3.27 Packing List

The contents of each shipping package shall be itemised on a detailed list showing the exact weight, extreme outside dimensions, length, width, and height of each container. If all containers are uniform in size and weight, the dimensions and weight of only one may be shown.

One copy of the detailed packing list shall be enclosed in each package delivered. There shall also be enclosed in one package a master packing list summarising and identifying each individual package which is a part of the shipment.

The box number in which the master packing list is contained should be shown on each packing list. On barrels, bags, drums, or kegs where it is not feasible to place the packing list inside the container, all pertinent information is to be stencilled on the outside and this will thus constitute a packing list.

3.28 Shipping Marks

Marking shall consist of the following information in sequence and in a frame, commensurate with the size of the container.

Consignee: The Project Manager – ZTIP

ZESCO LTD
Stand 6949, Great East Road
Lusaka
Zambia

plus additional information:

- Name and country of destination
- Contract number
- Port of discharge
- Item number, if applicable, package number in sequence and quantity per package
- Commodity description
- Net and gross weight and cubic measurement
- Shipper's and/or trademarks
- Caution marks, if applicable
- Other marking required by the Contract.

3.29 Shipping Advice

Shipping advice shall be emailed to the Employer prior to the on load date of the bill of lading, containing such information as the Contract number, loading port, brief description of the commodity to be shipped and the name of the claim settling agent in the port of destination, if any.

Demurrage incurred at the loading port due to the Contractor’s failure to provide adequate shipping advice within the timeframes specified or failure to make delivery during the contractual delivery period shall be for the account of the Contractor.

Commercial air facilities for passenger and freight transportation to Lusaka are available from international airlines.

3.30 Submission of Shipping Documents

The Contractor must prepare and forward within seven (7) days via airmail to:

The Project Manager – ZTIP

ZESCO LTD
Stand 6949, Great East Road
Lusaka
Zambia

the following documents:

- Invoice three (3) originals, ten (10) copies (originals preferably proved by Chamber of Commerce, Zambia).
- Certificate of Origin one (1) original, five (5) copies
- Certificate of Insurance one (1) original, five (5) copies. *[for the portion of the material for which the Interim Certificate is claimed]*
- Bill of Lading three (3) originals, five (5) copies.
- Packing Lists one (1) original and five (5) copies
- Test Certificates six (6) copies (where applicable)

Supporting invoices shall be rendered in the currency of payment as stipulated in the Contract.

Storage

The storage shall be in an environment similar to the installed location, i.e., indoor equipment shall be stored indoors (without heating and ventilation), and outdoor equipment shall be stored outdoors. Where required to protect against condensation and humidity, a desiccant shall be provided and its presence, with the need of periodic removal and dry-out, shall be so marked. When electric space heaters are provided for that purpose, these should be wired to the outside of the equipment so that energizing immediately upon receipt is possible without disassembly of crates, etc. This also requires that no combustible materials be left in the inside of the equipment.

All storage areas and storage facilities will be fenced and 24/7 security and surveillance will be provided by the Contractor at its own costs.

Items, which may be subjected to open storage for several months on site shall be suitably packed and protected from the weather.

The Contractor shall provide storage and handling instructions including descriptions for periodic inspection and / or storage maintenance to ascertain that no deterioration will occur during storage. One set of these instructions shall be fastened securely to the outside of the shipping unit.

The Contractor shall provide at the Employer's request, the Contractor recommended instructions for long term storage.

When equipment is specified for export shipment, the Contractor shall include packaging adequate for export shipment, and this packaging shall be such as to obtain approval and acceptance by transportation companies.

All equipment shall be shipped from the factory completely assembled as far as practicable, subject to the limitations of length, height, depth, and weight, etc. described in the Conditions of Contract or in the Technical Data Sheets for each of the equipment under this specification.

3.31 Weight and Size Limitations and Fees

The Contractor shall generally keep all packages and crates for delivery to the Site within the following maximum limits:

- Weight 40.0 tonnes
- Length 12.0m
- Width 3.5m
- Height 5.0m

Maximum axle loading shall be obtained from Zambia Roads and Highway Authorities and from the road authorities of all transit countries.

All road fees, including fees for heavy loads exceeding maximum limits, shall be paid by the Contractor to respective Road Authority in Zambia, and in the relevant transit country/countries.

3.32 Medical Care

The Contractor shall provide and maintain at his own expense for the use of his employees, adequate first-aid facilities for treatment in case of accident during execution of the Works.

Any order from the Employer as to extensions of or alterations to such first-aid facilities or services shall be promptly carried out.

The Contractor shall at all times give free access to authorized representatives of the Government and the Employer for inspection of first-aid facilities.

In the event of an outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, the Employer or local medical or health authorities for the purpose of dealing with and overcoming the same.

4 OVERHEAD LINE REQUIREMENTS

4.1 Overhead Line Design Data

The detailed overhead transmission line design parameters have been given in the technical schedules under general requirements.

4.1.1 General

Components to be provided by the Contractor shall include, but not be limited to:

- Tower foundations.
- Towers.
- Conductors.
- Overhead ground wires (including optical).
- Insulators.
- Conductor and overhead ground wire line hardware, including suspension assemblies, tension assemblies, bridging assemblies, mid-span joints, repair rods, vibration dampers and semi flexible spacers.
- Counterpoise cable and associated rods and fittings for earthing.
- Bird flight diverters at designated locations as per ESIA report.
- Number plates, identification plates and warning signs.
- Other materials and work necessary for the completion of the Transmission Lines such that the transmission systems shall operate in accordance with the requirements of the contract.
- Aircraft warning spheres shall conform with the Zambia Civil Aviation Authority (ZCAA) rules and guidelines.

The quality of design and manufacture of all materials, components and fittings shall be in conformance with the specifications, relevant standards and accepted good practice, and supported by test certificates where applicable.

4.1.2 Clearances

4.1.2.1 Live Metal-Structure Clearances (Tower Clearances)

The clearances between conductors and tower steel shall be calculated by the Contractor in accordance with standard and design (maximum swing angle 35°). The following shall be used for reference purposes only.

Description	Units	400kV	330kV	132kV
Between conductor and tower steel				
- Still air	m	3,70	2,80	1,30
- Maximum swing	m	2,90	2,50	1.10
- Maximum Swing Angle	°	35	35	35

4.1.2.2 Bundle Spacing

The Spacing between bundle Conductors shall be as follow:

Description	Units	400kV	330kV	132kV
Spacing between bundle Conductors	cm	45	45	N/A

4.1.2.3 Shielding Angle

The shielding angles shall be as follow:

Description	Units	400kV	330kV	132kV
Shielding Angle maximum	Degree (°)	15°	20°	30°

4.1.2.4 Vertical Ground Clearances

At the time of sagging, the Contractor shall make sure that the minimum clearances are obtained under the most critical working conditions.

The Contractor shall notify the Employer immediately if, for any reason, these clearances cannot be achieved.

For clearances not specified, the local laws and regulations shall be applied.

The minimum vertical clearances shall be as follows:

Description	Units	400kV	330kV	132kV
Normal ground	m	8,84	8,10	6,7
Roads – road level	m	11	9.5	7.5
Power transmission & telecommunications lines – lowest line conductor of upper line to highest conductor or earth wire of lower line	m	4,88	3,4	2,74
Power transmission & telecommunications lines – lowest line conductor of upper line to support of the lower line on which a person may stand	m	8,3	6,5	5,4

Description	Units	400kV	330kV	132kV
Railway crossing – inside the station (rail level, assuming electrified lines or potential future electrification)	m	14,3	13,6	10,9
Railway crossing – outside the station (rail level)	m	13,0	11,2	8,5
Street lighting	m	4,88	3,4	2,74

4.1.2.5 Horizontal Clearances

Description	Units	400kV	330kV	132kV
Major Highways	m	65	65	40
Main roads	m	65	65	40
Country crossing	m	30	30	30
Railway	m	40	40	40
Communication lines crossings	m	20	20	20
Farm lanes, dirt roads, and cart tracks	m	30	20	20
Buildings	m	35	25	25
Lines up to 330kV	m	35	35	35
Pipelines	m	60	60	30

4.1.2.6 Phase Spacing and Conductor Configuration

Vertical configuration of the conductors shall be used for all towers, except for transpositions and dead-end towers where Horizontal configuration of the conductors can be used.

The minimum horizontal spacing (D_horizontal) between fixing points of phases on the crossarm shall be derived from the following formula:

$$D = 0.62 \times \sqrt{f + l} + b + \frac{U_m}{150}$$

- where:
- D= horizontal spacing in m
 - f= final conductor sag at +80°C in m
 - l = length of insulator set in m (l = 0 for line-post insulators)
 - b= bundle conductor spacing in m
 - U_m= highest system voltage in kV

The minimum vertical spacing (V_vertical) between fixing points of conductors on the towers shall be derived from the following formula:

$$V = 0.75 \times \sqrt{f + l} + \frac{U_m}{150}$$

- where:
- V= vertical spacing in m
 - f= final conductor sag at +80°C in m
 - l = vertical length of insulator set in m
 - U_m= highest system voltage in KV

4.1.3 Climatic Data

While the detailed overhead transmission line design parameters are given in the Technical Schedules under General Requirements, the representative climatic conditions to be used for the transmission lines design shall be as follows:

Description	Units	Value
Minimum ambient temperature	°C	-1
Average daily temperature	°C	25
Maximum ambient temperature	°C	45
Wind speed*	m/s	36
Keraunic levels (average ground flashes/km ² / year)	No/km ² /year	38

* Wind speed is given as 3-second gust under terrain category B of IEC 60826:2017. This can be equated to a VRB wind speed value of 25.9m/s (10-minute mean) under the IEC 60826 wind load methodology.

4.1.4 Limiting Tension of Cable

The conductors shall not exceed the following tension limits:

- Final tension with no wind on bare conductor at 25°C, over normal terrain shall not exceed 20% of the rated tensile strength.
- Initial tension with no wind on bare conductor at minimum temperature (-1°C) shall not exceed 40% of the rated tensile strength.
- Final tension with maximum wind on bare conductor at 15°C shall not exceed 40% of the rated tensile strength.

Limiting tension conditions for the shield wire and OPGW shall be the same as the conductor limiting conditions, but the final sag with no wind at 25°C shall not exceed 90% of the conductor sag under the same conditions.

4.1.5 Strength and Safety Factors

The strength and safety factor and overload factors for foundation, tower design, insulator strings and all kinds of conductors shall be as required in this specification and associated data tables as provided in this bidding document and technical schedule. The safety factor is either stipulated as a figure (for foundation and tower design) or is already incorporated in values and material data as given in this specification and associated data tables as provided.

The Contractor shall ensure that the strength coordination provided within the design follows the basic principles as stipulated within IEC 60826.

Based on the recommended failure sequence of structure components, the following structure partial factors (γ_M) for material strength are to be applied as minimum:

Strength factor steel members suspension towers γ_M	1.25
Strength factor steel members angle/tension towers γ_M	1.25
Strength factor steel bolts of tower connections γ_M	1.25

The tower load factors based on Proposed partial factors (γ_F) for actions shall be applied to the different loads within the respective load cases:

Deadweight γ_G Normal load (N1...Nn)	Compression 1,2 Uplift 0,9
Deadweight γ_G Exceptional load (E1....En)	Compression 1,2 Uplift 0,9
Wind γ_W Normal load (N1.....Nn)	1.3
Wind γ_W Exceptional load (E1....En)	1
Conductor tension γ_C Normal load (N1.....Nn)	1.3
Conductor tension γ_C Exceptional load (E1....En)	1
Construction/Maintenance γ_P Exceptional load (E1.....En)	1.5

4.1.6 Insulators and Fittings

The insulators, insulator assemblies and suspension clamps, except tension clamps, shall be designed for the same load combinations as towers. The minimum safety factors related to the mechanical or electromechanical load shall be as stated in EN 50341.

4.2 OHL Design Standards and Codes

The equipment, materials and labour employed in the fabrication, delivery, erection or installation and testing of the parts of the project shall comply with applicable and approved standards as stated in relevant sections. The principal basis for reference shall be the appropriate portions of the latest revision of internationally recognized standards listed here below together with the issuing authority contact:

ANSI	American National Standards Institute Inc. Washington, DC. Headquarters 1899 L Street, NW, 11 th Floor Washington, DC, 20036 Tel: 202.293.8020 Fax: 202.293.9287
IEEE	Institute of Electrical and Electronic Engineers Inc. +1 800 701 IEEE (USA and Canada) +1 732 981 0060 (Worldwide)
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive, West Conshohocken, Pennsylvania, USA Phone: (610) 832-9500 Fax: (610) 832-9555
BSI	British Standards Institution 389 Chiswick High Road London W4 4AL, England
IEC	International Electrotechnical Commission 1 Rue de Varembe CH-1211 Geneva 20, Switzerland

ISO	ISO International Organization for Standardization Central Secretariat 1, ch. De la Voie-Creuse CP 56 CH-1211 Geneva 20, Switzerland
ITU	International Telecommunication Union Telecommunication Standardization Bureau Place des Nations CH-1211 Geneva 20, Switzerland
IEC	International Electrotechnical Commission Publications 60826:2003 Design Criteria of overhead transmission lines
ISO	International Standards Organization 9001 Quality System Model for Quality Assurance in Design / Development, Manufacture and Testing 9002 Quality System Model for Quality Assurance in Production, Installation and Servicing
CENELEC	The European Committee for Electrotechnical Standardization EN50341-1:2012 Overhead electrical lines exceeding AC 1 kV

The order or hierarchy of standards and codes shall be as follows:

- This Specification.
- Local Applicable Standards.
- International Standards (IEC, ISO or ITUEC).
- ASTM, IEEE, ACI, BS and other recognized National/Regional Standards.

Where a conflict occurs between values tabulated in this document and those computed using applicable standards, the more conservative value shall be adopted.

Where the equipment is specified to a particular standard, the Contractor may supply equipment of an equivalent standard, if approved by the Employer. If the equipment application does not fall within the scope of the above standards and codes, such equipment shall be provided in compliance with good Project Management practice, appropriate with the service required and approved by the Employer. Furthermore, in case of conflict between this specification and any of the referenced codes and standards, the above order shall be followed.

A complete tender list of the applicable codes, standards, and specifications shall have been submitted as part of the documents for review. English language copies of any such references shall be furnished by the Contractor as required by the Employer.

4.3 Phase Conductors

4.3.1 General

This specification covers the detailed requirements for the design, fabrication, tests and shipping of concentric-lay stranded Aluminium Conductor Steel Reinforced conductor (ACSR) for 400kV, 330kV and 132kV overhead lines. It is not the Employer's intent to specify all technical requirements nor to set forth those requirements adequately covered by applicable codes and standards. The Contractor shall furnish high quality materials meeting the requirements of this specification and applicable industry standards.

The Contractor shall bear the full responsibility that the conductors have been designed and manufactured in accordance with all standards and applicable regulations and perform under the condition and to the standards specified herein.

No deviations shall be made from this specification and standards unless waived or modified in writing by the Employer. The Contractor shall obtain from its sub-Contractor a statement as to compliance with this specification without exception and/or if there are any exceptions, these shall be described in detail and included in the Contractor's Tender. The Contractor shall add a statement that no other exceptions are taken to this specification.

4.3.2 Standards

The materials covered under these specifications shall conform to the following standards and codes except as noted. The conductors furnished shall be in accordance with, but not limited to, the latest issues of the following applicable standards, including all addenda, in effect at time of purchase order unless otherwise stated in this specification.

EN 50182	Conductors for overhead lines. Round wire concentric lay stranded conductors
EN 60889	Hard drawn aluminium wire for overhead line conductors
EN 50189	Conductors for overhead lines. Zinc coated steel wires
IEC 61089	Round Wire Concentric Lay Overhead Electrical Stranded Conductors
IEC 61394 EN 50326	Characteristics of Greases for Aluminium, Aluminium Alloy and Steel Bare Conductors
ASTM B 232/ B 232M	Specification for concentric-lay-stranded aluminium conductors, coated-steel reinforced (ACSR)
EN 61232	ACS wires for overhead line conductor
IEC 61395	Overhead electrical conductors – Creep test procedures for stranded conductors
IEC 62219	Overhead electrical conductors – Formed wire, concentric lay, stranded conductors
IEC 61284	Overhead lines – Requirements and tests for fittings
ISO 9001	Quality System Model for Quality Assurance in Design/ Development, Manufacture and Testing
ISO 9002	Quality System Model for Quality Assurance in Production, Installation and Servicing
IEC 62641	Conductors for overhead lines - Aluminium and aluminium alloy wires for concentric lay stranded conductors
IEC 63248	Conductors for overhead lines - Coated or clad metallic wire for concentric lay stranded conductors

4.3.3 Conductors’ Characteristics

The line conductor shall consist of Aluminium Conductor Steel Reinforced conductor (ACSR) having the characteristics stated below.

Description	Units	400kV	330kV	132kV
Type		ACSR	ACSR	ACSR
Code Name		Bluejay	Bison	Wolf
Strands		45/7	54/7	30/7
Aluminium wire diameter	mm	4.0	3.0	2.59
Steel wire diameter	mm	2.66	3.0	2.59
Overall diameter	mm	31.98	27	18.13
Cross section area- aluminium	mm ²	563.93	381.7	158.06
Cross section area- steel	mm ²	39.03	49.5	36.88
Total cross section area	mm ²	602.96	431.2	194.94
Mass	kg/km	1868	1444	727
Rated tensile strength	kN	132.63	120.90	69.2
Final modulus of elasticity	N/mm ²	66600	68650	83400
Coefficient of linear thermal expansion	10 ⁻⁶ /°C	21.12	19.3	18.43
DC resistance at 20°C	ohms/km	0.05136	0.07573	0.1828

Bidder should submit guaranteed ampacity for Bluejay (twin bundle) /Bison (Twin Bundle) /Wolf (single) at [85/80/75] °C with assumptions (ambient temperature, wind speed, reference altitude, emissivity/absorptivity, solar heat flux), and provide PLS-CADD thermal rating files used to derive these values as part of the GTCs. Please note that the guaranteed values are compliance-mandatory, recorded in the GTS, not point-scored.

4.3.4 Workmanship and Finish

Aluminium and galvanized steel material and coatings shall be formulated to resist corrosion (including general pitting and inter-granular, galvanic, crevice and stress corrosion) when exposed to the severe environment of the transmission line. All overhead conductors shall have a design service life of minimum 30 years. The conductor material and the grease are to be suitable for continuous operation at 95°C without deterioration.

The aluminium shall be of the highest conductivity commercially obtainable. The Contractor shall submit certificates of analysis giving the exact conductivity value per: $m \cdot mm^2$.

The conductor shall comply in all respects with the requirements of EN 50182 or IEC 61089 or other approved standard. The outer layer wires shall be pre-formed so that they remain inert when the conductor is cut. The stranding of each layer of the conductor shall be as close and even as possible. The lay of the outermost layer shall be right-hand.

Each layer of conductor except the outer layer shall be covered with an approved grease of applied mass per unit length determined in accordance with EN 50182 or IEC 61089 and as stated in the Technical Schedules. The extent of grease to be applied shall be Case 2 as described in EN 50182 or IEC 61089. After application of grease and before the outer layer of wires is stranded the penultimate layer of wires shall be thoroughly wiped so that all remaining visible grease on the conductor is between the wires of the penultimate layer. The grease shall conform to the requirements of type 20A150 according to EN 50326 or IEC 61394 and shall not corrode the wires. It shall be compatible with any wire drawing lubricant present on the conductor wires and shall not flow within, nor exude from, the conductor below the drop point stated further. It shall exhibit adequate resistance to oxidation and shall conform to the test requirements stated in IEC 61394. The grease drop point shall not be less than 150°C. Unless the Contractor can produce evidence in the form of service records, test certificates, etc. which demonstrate to the satisfaction of the Employer that this requirement is met, the Contractor shall carry out such tests as the Employer may require, at no additional cost to the Employer.

Precautions shall be taken during manufacture, storage and erection of conductors to prevent the possibility of contamination by copper or other materials that may adversely affect the aluminium.

The surface of the conductors shall be free from points, sharp edges, abrasions, or other departures from smoothness or uniformity of contour that would tend to increase radio interference and corona loss.

The Contractor shall ensure that the numbering of the Conductor drums shall be sequential during manufacturing i.e. pairing drums by number from the same laying/winding on the same day of manufacture.

The Contractor shall pair drums of similar manufacturing details for each sub-conductor per phase, to obtain the closest matching conductor sag characteristics in each span and also make accurate sagging work easier during construction.

4.3.5 Test and Reports

4.3.5.1 General :

All materials shall comply with the test criteria, and the Employer's acceptance of the conductors and accessories shall not relieve the Contractor of his responsibility for meeting all the requirements of this specification.

The Contractor shall carry out at his own expense all tests necessary to ensure the satisfactory design and manufacture of conductors in accordance with IEC Standards.

Conductors shall be given the manufacturer's routine shop tests and quality conformance tests and shall be witnessed by the Employer or his authorized representative unless waived in writing. No conductors shall be shipped until released for shipment by the Employer.

The Contractor shall make all preparation for tests and provide the test apparatus and personnel and shall notify the Employer the date of the tests to be witnessed in accordance with the requirements of this specification.

The conductors shall be subjected to the Type tests, if specified and Factory Acceptance tests in accordance with IEC 61089. Even though the Employer or his representative performs or witnesses the required tests, and the conductors meet the acceptance criteria, the Contractor shall not be relieved of the responsibility of providing conductors conforming to all requirements of the specification.

4.3.5.2 Type tests

Conductor shall be type tested in accordance with EN 50182, IEC 61089 and subsequent standards. Type test records and certificates for identical type of conductor may be accepted provided that those records and certificates are not older than eight years and tests were carried in accredited laboratory.

4.3.5.3 Sample tests

FAT tests shall be done according to EN 50182 or IEC 61089 standard. This shall be demonstrated during FATs.

4.3.5.4 Routine tests

Routine tests in accordance with EN 50182 shall be carried out during the production on the complete conductor to prove compliance.

4.3.6 Marking

The following information shall be clearly marked in indelible paint on both flanges of every conductor drum in English:

- Type of conductor and name.
- Size of conductor.
- Exact length in meters.
- Serial number, if applicable
- Net weight in kg.
- Gross weight in kg.
- Drum number.
- Manufacturer's name and country of origin.
- Year of manufacture.

- Purchaser’s order number.
- Shipping destination.
- Rotation arrow

4.3.7 Packing

Packing and crating methods are the responsibility of the Contractor.

The conductor shall be shipped in matched sets of eight in nominal standard lengths on non-returnable wooden or steel reels. The reels shall be designed for normal tension stringing operations.

The drums of the conductor reels shall be wrapped with a moisture resistant protective covering. The inner flanges of the reels shall be lined with moisture resistant solid fibreboard.

The two outer layers of conductor shall be interleaved, and the outer layer covered with moisture resistant paper. A protective covering of a single layer of moisture resistant solid fibreboard, secured with steel banding, shall be wrapped overall. The reels shall be so constructed to withstand normal loads due to tension stringing operations and they shall be sufficiently sturdy to withstand the additional handling inherent to ocean shipment.

The reels shall be wood lagged, the lagging to be secured with two steel bands. The steel bands shall be intermittently stapled to the lagging. The Contractor shall submit drawings of reels for approval.

4.3.8 Submittals

Submittals required with tender include:

- The Technical Data Schedules for each type of conductor offered.
- The manufacturer’s quality assurance program and/or manual together with a list of international/national standard specifications covering raw materials, components, processes, tolerances, test procedures, etc. and a list of tests normally carried out on raw materials and a description of test equipment used.
- Type of grease and application method.
- A full list of routine and sample tests carried out during and after manufacture and a description of the test equipment used.
- A full list of all type tests performed and all relevant data confirming results.
- Detailed drawings of each type of drum that will be used for packing

Submittals Required Following Award of the Contract

- Details of manufacturing, test and shipping schedules and transportation/delivery proposals.
 - Certificates covering raw materials used in the manufacture of conductors.
 - Certificates covering routine tests carried out on wires before stranding of conductors.
 - Certificates covering the sample tests carried out on wires after stranding and type tests on complete conductor before shipping of conductors.
 - Stress-strain curves.
 - A list giving per drum, the drum number, the size of conductor, the exact length, the net weight, the gross weight, the number of any joints made during stranding and their distance from the out end.
-

4.4 Shield Wires

4.4.1 General

This specification covers the detailed requirements for the design, fabrication, tests and shipping of the bare concentric-lay-stranded aluminium clad steel shield wire, and for ACSR shield wire.

4.4.2 Standards

The materials covered under this Specification shall conform to the following standards and codes except as noted.

ASTM B415	Standard specification for hard-drawn aluminium-clad steel wire
ASTM B416	Standard specification for concentric-lay stranded aluminium-clad steel conductors
IEC 61394 EN 50326	Characteristics of Greases For Aluminium, Aluminium Alloy And Steel Bare Conductors

4.4.3 Conductors’ Characteristics

The shield wires to be furnished shall be aluminium clad steel having the characteristics stated below.

4.4.3.1 Shield Wire Characteristics

Description	Units	Data 400kV	Data 330kV / 132kV
Type	-	ACSR	ACS
Code Name	-	95/55	7/6 AWG
Number of wires	-	12/7	7
Wire diameter	mm	3.20	4.11
Overall diameter	mm	18.0	12.33
Mass	kg/km	700	619
Area	mm ²	152.8	93.1
Ultimate tensile strength	kN	77.8	101.14
Modulus of elasticity	N/mm ²	107000	158620
Coefficient of linear thermal expansion	10 ⁻⁶ /°C	15.3	13.0
DC resistance at 20°C	Ohms/km	0.2992	0.922

Note: Baseline ACS cladding class (i.e., its %IACS conductivity) is 20% IACS

4.4.4 Workmanship and Finish

All shield wires shall have a design service life of minimum 30 years.

The conductor shall comply in all respects with the requirements of ASTM B415 and ASTM B416 or other approved standard. The outer layer wires shall be pre-formed so that they remain inert when the conductor is cut. The stranding of each layer of the conductor shall be as close and even as possible. The lay of the outermost layer shall be right-hand.

Each layer of conductor except the outer layer shall be covered with an approved grease of applied mass per unit length determined in accordance with IEC 61089 and as stated in the Technical Schedules. The extent of grease to be applied shall be Case 2 as described in IEC 61089. After application of grease and before the outer layer of wires is stranded the penultimate layer of wires shall be thoroughly wiped so that all remaining visible grease on the conductor is between the wires of the penultimate layer. The grease shall conform to the requirements of EN 50326 or IEC 61394 type 20A80. Used grease shall be tested in accordance with EN 50326 to determine the characteristics of the grease and on top of it the drop point test has to be performed. Unless the Contractor can produce evidence in the form of test reports or test certificates which demonstrate to the satisfaction of the Employer that this requirement is met, the Contractor shall carry out such tests as the Employer may require, at no additional cost to the Employer.

Precautions shall be taken during manufacture, storage and erection of conductors to prevent the possibility of contamination by copper or other materials that may adversely affect the aluminium.

The surface of the conductors shall be free from points, sharp edges, abrasions, or other departures from smoothness or uniformity of contour that would tend to increase radio interference and corona loss.

The Contractor shall ensure that the numbering of the Conductor drums shall be sequential during manufacturing i.e. pairing drums by number from the same laying/winding on the same day of manufacture.

The Contractor shall pair drums of similar manufacturing details for each sub-conductor per phase, to obtain the closest matching conductor sag characteristics in each span and also make accurate sagging work easier during construction.

4.4.5 Tests and Reports

4.4.5.1 Type tests

Earth wire shall be type tested in accordance with relevant EN standards (see 6.2). Type test records and certificates for identical type of conductor may be accepted provided that those records and certificates are not older than eight years and tests were carried in accredited laboratory.

4.4.5.2 Sample tests

FAT tests shall be done according to relevant IEC standards. This shall be demonstrated during FATs

4.4.5.3 Routine tests

Routine tests in accordance with relevant EN standards shall be carried out during the production on the complete conductor to prove compliance.

4.4.6 Marking

The following information shall be clearly marked in indelible paint on both flanges of every conductor drum in English:

- Type of conductor and name.
- Size of conductor.
- Exact length in meters.
- Serial number if applicable
- Net weight in kg.
- Gross weight in kg.
- Drum number.
- Manufacturer’s name and country of origin.
- Year of manufacture.
- Purchaser’s order number.
- Shipping destination.
- Rotation arrow

4.4.7 Packing

Packing and crating methods are the responsibility of the Contractor.

The conductor shall be shipped in matched sets of eight in nominal standard lengths on non-returnable wooden or steel reels. The reels shall be designed for normal tension stringing operations.

The drums of the conductor reels shall be wrapped with a moisture resistant protective covering. The inner flanges of the reels shall be lined with moisture resistant solid fibreboard.

The two outer layers of conductor shall be interleaved, and the outer layer covered with moisture resistant paper. A protective covering of a single layer of moisture resistant solid fibreboard, secured with steel banding, shall be wrapped overall. The reels shall be so constructed to withstand normal loads due to tension stringing operations and they shall be sufficiently sturdy to withstand the additional handling inherent to ocean shipment.

The reels shall be wood lagged, the lagging to be secured with two steel bands. The steel bands shall be intermittently stapled to the lagging. The Contractor shall submit drawings of reels for approval.

4.4.8 Submittals

Submittals required with tender include:

- The Technical Data Schedules for conductor offered.
- The manufacturer’s quality assurance program and/or manual together with a list of international/national standard specifications covering raw materials, components, processes, tolerances, test procedures, etc. and a list of tests normally carried out on raw materials and a description of test equipment used.
- A full list of routine and sample tests carried out during and after manufacture and a description of the test equipment used.
- A full list of all type tests performed and all relevant data confirming results.
- Detailed drawings of each type of drum that will be used for packing

Submittals required following award of the contract include:

- Details of manufacturing, test and shipping schedules and transportation/delivery proposals.
- Certificates covering raw materials used in the manufacture of conductors.
- Certificates covering routine tests carried out on wires before stranding of conductors.
- Certificates covering the sample tests carried out on wires after stranding and type tests on complete conductor before shipping of conductors.
- Curves of creep versus load and time.
- A list giving per drum, the drum number, the size of conductor, the exact length, the net weight, the gross weight, the number of any joints made during stranding and their distance from the out end.

4.5 **Optical Overhead Ground Wire (OPGW) and Accessories**

4.5.1 **General**

This specification covers the detailed requirements for the design, fabrication, test and shipping of composite Overhead Ground Wire with Optical Fibre (OPGW) and hardware/fittings for use as shield wire of overhead transmission for 400kV, 330kV and 132kV lines.

The OPGW furnished shall be in accordance with, but not limited to, the latest issues of the following applicable standards and recommendations, including all addenda, in effect at the time of the purchase order unless otherwise stated in this specification.

4.5.2 **Standards**

The materials covered under this specification shall confirm to the following standards except as noted:

EN 50182	Conductors for overhead lines – round wire concentric lay conductors
EN 50183	Conductors for overhead lines – aluminium magnesium silicon alloy wires
EN 61232	Aluminium-clad steel for electrical purposes
IEC 60794-1	Optical Fibres Part 1 – Generic Specification
IEC 60793-2	Optical Fibres Part 2 – Product Specification
ITU T G652	Characteristics of a single-mode optical fibre and cable
IEC 60794-4 -10	Optical fibre cables – Part 4-10: Family specification – Optical ground wires (OPGW) along electrical power lines
IEEE 1138	Construction of composite fibre optic overhead ground wire (OPGW) for use in electric utility power lines
IEC 60794	Optical Fibre Cables. All relevant Parts
ITU G.650	Definitions and test methods
ITU G.655	Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable
CIGRE TF22.11.03	Guide to fittings for optical cables on transmission lines – Part 1: Selection and use
ISO 9001	Quality System Model for Quality Assurance in Design/ Development, Manufacture and Testing
ISO 9002	Quality System Model for Quality Assurance in Production, Installation and Servicing

4.5.3 OPGW Characteristics

The minimum requirement for the OPGW shall be:

4.5.3.1 OPGW Characteristics, 330kV and 132 kV

Description	Units	Data 330kV	Data 132kV
Type	-	OPGW / similar to ACS 7/6 AWG ¹⁵	OPGW / similar to ACS 7/6 AWG ³
Mechanical/Electrical Characteristics			
Overall diameter	mm	Bidder to state	Bidder to state
Mass (dry)	kg/km	Bidder to state	Bidder to state
Ultimate tensile strength	kN	≥105	≥105
Modulus of elasticity	N/mm ²	≥96400	≥96400
DC resistance at 20°C	Ohms/km	≤0.258	≤0.258
Coefficient of linear thermal expansion	10 ⁻⁶ /°C	≤17.1	≤17.1
Fault current capacity (20°C – 160°C) at 0.2s	kA ² s	≥200	≥200
Short circuit current	kA	31.5	31.5
Minimum delivery length per drum	km	4	4
Optical Characteristics			
Lightning Class (IEEE 1138)		Class 2	Class 2
Number of fibres	Nos.	48	48
Fibre type		ITU 652.D	ITU 652.D
Mode		Dual Window single mode	Dual Window single mode
Optimized wavelength	nm	1550 / 1310	1550 / 1310
Polarisation mode dispersion		≤ 0.1 p	≤ 0.1 p
Longitudinal water block		Polymeric filling compound	Polymeric filling compound
Reinforcement member		Fiber glass	Fiber glass
Halogen free		Yes	Yes
Metal free		Yes	Yes
Maximum pulling force	kN	>2,5	>2,5
Nominal permanent tensile strength	kN	>1,5	>1,5
Polarisation mode dispersion	ps/vkm	<0,1	<0,1
Maximum attenuation coefficient at 1310nm	db/km	0.36	0.36
Maximum attenuation coefficient at 1550nm	db/km	0.22	0.22
Chromatic dispersion		<=3.5 ps/(nm.km) @1228-1399 nm <18 ps/(nm.km) @1550 nm	<=3.5 ps/(nm.km) @1228-1399 nm <18 ps/(nm.km) @1550 nm
Cut-off Wavelength		1100-1280 nm (measured on 2 m fibre) <=1270 nm (measured on 22 m fibre)	1100-1280 nm (measured on 2 m fibre) <=1270 nm (measured on 22 m fibre)
Normal temperature range		-10 ... 80°C	-10 ... 80°C
Maximum temperature < 1.0 second		180°C	180°C

The OPGW earth conductor 330kV and 132kV shall have the characteristics stated in the Technical Schedules and shall comply with the requirements of IEC 60794-4-10 or IEEE 1138.

The fibres shall be Single-Mode type, suitable for operation at wavelengths of both 1310nm and 1550nm and shall conform to ITU-T Recommendation G.652.D.

The number of fibres to be contained within the optical fibre cable shall be 48 as a minimum.

4.5.3.2 OPGW Characteristics, 400kV

¹⁵ The OPGW shall comply with IEC 60794-4-1: Optical fibre cables – Part 4-1: Aerial optical cables along electrical power lines – OPGW, and shall possess mechanical and electrical characteristics approximately equivalent to ACS 7/6 AWG overhead earth wire in terms of rated tensile strength, unit weight, and current-carrying capacity.

Description	Units	Data
Mechanical/Electrical Characteristics		
Type	-	OPGW / similar to ACSR 95/55 ¹⁶
Overall diameter	mm	Bidder to state
Mass (dry)	kg/km	Bidder to state
Ultimate tensile strength	kN	≥79
Modulus of elasticity	N/mm ²	≥96400
DC resistance at 20°C	Ω/km	≤0.2992
Coefficient of linear thermal expansion	10 ⁻⁶ /°C	≤17.1
Fault current capacity (20°C – 160°C) at 0.2s	kA2s	≥200
Short circuit current	kA	31.5
Minimum delivery length per drum	km	4
Optical Characteristics		
Lightning Class (IEEE 1138)		Class 2
Number of fibres	Nos.	48 (24+24)
Fibre type		ITU – T.G.652D ITU – T.G.655
Mode		Dual Window single mode
Optimized wavelength	nm	1550 / 1310
Polarisation mode dispersion		≤ 0.1 p
Longitudinal water block		Polymeric filling compound
Reinforcement member		Fiber glass
Halogen free		Yes
Metal free		Yes
Maximum pulling force	kN	>2,5
Nominal permanent tensile strength	kN	>1,5
Polarisation mode dispersion	ps/√km	<0,1
Maximum attenuation coefficient at 1310nm	db/km	0.36
Maximum attenuation coefficient at 1550nm	db/km	0.22
Chromatic dispersion		≤3.5 ps/(nm.km) @1228-1399 nm ≤6.0 ps/(nm.km) @1550 nm
Cut-off Wave Length		1100-1280 nm (measured on 2 m fibre) ≤1270 nm (measured on 22 m fibre)
Normal temperature range		-10 ... 80°C
Maximum temperature < 1.0 second		180°C
Lifetime expected		40 years

The OPGW earth conductor 400kV shall have the characteristics stated in the Technical Schedules and shall comply as far as possible with the requirements of IEC 60794-4-10 or IEEE 1138.

The fibres shall be Single-Mode type, suitable for operation at wavelengths of both 1310nm and 1550nm and shall conform to ITU-T.G.652.D and ITU-T.G.655. The number of fibres to be contained within the optical fibre cable shall be 48 (24+24) as a minimum.

4.5.3.3 Design Requirements

The OPGW cable construction shall comply with the requirements set forth in the relevant IEC publications. The OPGW shall meet both the construction and performance requirements such that the ground wire function, the optical fibre integrity and optical transmissions characteristics are suitable for the intended purpose. The cable shall consist of multiple optical fibre units as stated in the Technical Schedules. There shall be no factory splices within the cable structure of a continuous cable length. The OPGW shall withstand lightning, short circuit currents, induced currents and voltages from the power conductors, and expected abnormal external conditions, as well as normal service conditions, without impairment to the optical signal transmission or degradation of the optical fibre specification for the lifetime of the project. The short circuit parameters are similar to that defined for earth wire.

¹⁶ The OPGW shall comply with IEC 60794-4-1: Optical fibre cables – Part 4-1: Aerial optical cables along electrical power lines – OPGW, and shall possess mechanical and electrical characteristics approximately equivalent to ACSR 95/55 overhead earth wire in terms of rated tensile strength, unit weight, and current-carrying capacity

These shall not cause breakage or deformation of any component of the cable. The attenuation coefficient shall not rise to more than 0,05 dB/km above that of the unloaded cable at a normal ambient temperature. Any increase in attenuation shall be temporary and shall return to its original level within 15 minutes.

The lightning discharge is defined as:

- 10 Coulomb; duration 5 ms,
- 100 Coulomb; duration 500 ms.

In the event of a one-off lightning discharge (lightning test), the residual breaking strength shall be at least 50 % RTS. The water screen and any loose tube shall be unaffected by such discharge. None of the optical fibre transmission properties shall be affected by lightning strikes. The maximum allowable attenuation increase at the point of the strike shall be less than 0,01 dB. Any attenuation increase shall be temporary and shall return to its original level within 15 minutes. The OPGW shall be able to withstand the high-frequency (>1 Hz) and low-frequency (<1 Hz) vibrations occurring on the high-voltage transmission line. All OPGW design and fatigue requirements should be harmonized to a minimum 40year design life, with fatigue tests representative of this.

Any increase in the attenuation coefficient resulting from high-frequency or low-frequency vibrations according to (fatigue tests) and installation loads according to (sheave test) during the course of the cable's service life or mechanical loads due to installation shall be less than 0,01 dB/km. The OPGW shall be grounded at each tower through jumper assemblies and approved clamps to be used for connections, except for the towers where OPGW is insulated according to Technical Specification. The number, diameter and cross-sectional areas of the aluminium-clad steel wires and the number of optical fibres shall comply with the requirements listed in the Technical Schedules. The complete OPGW shall have a design lifetime of at least 40 years of service.

4.5.3.4 Breaking Strength

The rated breaking strength of the completed OPGW shall be taken as no more than 90% of the sum of the rated breaking strengths of the individual wires, calculated from their nominal diameter and the specified minimum tensile strength.

The rated breaking strength shall not include the strength of the optical unit. The fibre optic unit shall not be considered a load bearing tension member when determining the total rated breaking strength of the OPGW.

4.5.3.5 Central Fibre Optic Unit

General

The central fibre optic unit shall be designed to house and protect multiple buffered optical fibre units from damage due to forces such as crushing, bending, twisting, tensile stress, moisture and water/moisture ingress. The central fibre optic unit and the outer stranded metallic conductors shall serve together as an integral unit to protect the optical fibres from degradation due to vibration and galloping, wind loading, wide temperature variations, lightning and fault current, as well as environmental effects, which may produce hydrogen.

Depending on the requirements stated in the Technical Schedules, the central fibre optic unit encasing the optical fibres should be an aluminium tube, channelled aluminium rod or a stainless-steel tube.

For an aluminium and/or stainless-steel tube, it may be fabricated as a seamless extruded tube, seam welded or a tube without a welded seam.

For an aluminium rod, it may be fabricated with one or more channels or grooves and formed into a helix to house the optical fibres. An outer protective shield may be applied around the rod such as an aluminium tube or a helically applied overlapping aluminium tape to provide an additional mechanical and environmental barrier.

Filling Compound

The interstices of the fibre optic unit and cable shall be filled with a suitable compound to prohibit any moisture ingress from outside or any water longitudinal migration along the fibre optic unit or along the fibre optic cable. The water tightness of the cable shall meet or exceed the test performance criteria as per IEC 60794. The filling compound to be used shall be compatible with all the components it may come in contact with and shall absorb and/or inhibit generation of hydrogen within the cable.

The filling compound shall not affect the colour of the primary or secondary coating, or encapsulates commonly used in splice enclosures, shall be easily removed from the secondary coating with a non-toxic cleaning solvent. The filling compound used shall be a non-toxic homogenous waterproofing gel that is free of dirt and foreign matter, non-hygroscopic, electrically non-conductive, non-nutritive to fungus, free from all smell and shall not affect human skin.

The filling compound shall remain stable for ambient temperatures between -20°C and +80°C and shall not drip, flow or leak with age or at high temperature during short duration lightning strikes and short circuit currents.

4.5.3.6 Optical Fibre

Fibre Core and Cladding

The fibres shall comply with the geometrical data given in the Technical Schedules. Generally, single-mode fibres, dispersion-unshifted and multi-mode fibres with 50/125 µm and 62.5/125 µm core/clad diameters are considered in this specification.

The core and the cladding shall consist of all glass, which is predominantly silica (SiO₂). Factory splicing of fibre is not allowed.

The Contractor shall present a graph showing the typical reflective index profile of the fibre. The Contractor shall also present a tension test and give the stress corrosion factor value and typical plot of variables over tension and probability for break.

Primary Coating

The bare fibre shall be primarily coated with UV-cured acrylic material for protection from abrasion during subsequent handling or manufacturing.

The primary coated fibres shall be proof tested for a time longer than 1.0 s with a strain of minimum 1.0 %. The Contractor shall state the applied strain force.

Buffer Construction

A buffer for protection from physical damage shall surround the individually coated fibres during fabrication, installation and performance of the OPGW. Depending on the requirements specified in the Technical Schedules, the buffer construction that may be used to isolate the fibres, can either be a loose buffer or a tight buffer construction.

For a loose buffer construction, it shall consist of a tube that surrounds each fibre or fibre group, such that the inner diameter of the tube is greater than the outside diameter of the fibre or fibre group. The interstices inside and outside the tube may be filled with a filling compound.

The tight buffer construction shall consist of suitable materials that come in contact with the coated fibre.

4.5.4 Fabrication

OPGW earth conductor shall consist of at least two layers of aluminium alloy/aluminium-clad steel wires with an optical fibre communication cable enclosed either in one or more stainless steel tubes or in the central aluminium alloy tube.

OPGW shall have a design service life of minimum 30 years and a warranty of at least 5 years.

Precautions shall be taken during manufacture, storage and erection of conductors to prevent the possibility of contamination by copper, iron or other materials that may adversely affect the aluminium or stainless steel.

Aluminium alloy wires shall be aluminium-magnesium-silicon grade in accordance with EN 50183.

Where aluminium-clad steel wires are used they shall be to EN 61232 class 20SA.

All wires, aluminium alloy and aluminium-clad, shall be of uniform circular section, smooth and free from surface imperfections. Aluminium-clad steel wires shall be pre-formed so that they remain inert when the conductor is cut. The outer layer shall be right-hand lay. There shall be no joints in individual wires in a drum length unless specifically approved.

The optical fibres shall be housed in stainless steel tube inside the OPGW earth conductor and shall be protected from water ingress by the application of a waterproof gel, applied between the buffer tubes and the plastic sheath or seamless metallic tube during manufacture.

The OPGW shall be designed to withstand lightning strokes, short-circuit current, ambient and extreme temperatures and loadings as specified in the Technical Schedules with no effect on the attenuation of the optical fibres and no permanent damage to the data transmission characteristics of the fibre optic cable.

The optical fibre cable shall be of the loose tube type, with the fibres contained in a buffer or buffer tubes contained in the central core of the OPGW earth conductor.

The buffer tubes housing the optical fibres shall be coded for ready identification at either end. Buffer tubes shall be filled with a compound to provide resistance to water penetration, vibration damping and for shock absorption.

Each individual fibre shall be colour coded for identification purposes and details of the colour coding scheme adopted shall be stated in the bid.

The optical fibre cable shall be designed so that the fibres shall be free from longitudinal strain under all conditions of loads and ambient temperatures specified.

The design of the fibre optic cable shall be such that a tension of 65% of the OPGW UTS will not produce strain in the fibres and will not result in an increase in attenuation.

Sag and tension of the ACS earthwire and associated OPGW shall be calculated for the following cases and limitations:

- Everyday temperature at 25°C + no wind – tension limit 20% adjusted to match 90% of the phase conductor sag
- Erection/ Minimum temperature -1°C + no wind - tension limit 40% of conductor ultimate tensile strength
- Wind 15°C + Full wind - tension limit 40% of conductor ultimate tensile strength

4.5.5 Tests**4.5.5.1 Qualification tests**

Tests on complete composite fibre optic earth conductor shall be carried out in general accordance with the IEEE 1138 and other referenced standards. A lightning arc test shall be carried out for Class 2 requirements. Any deviation from these methods or any alternative methods proposed must have prior approval.

4.5.5.2 Field routine acceptance tests

The Contractor shall carry out attenuation tests to confirm the satisfactory condition of the optical fibres prior to erection. These will be compared against the values obtained prior to shipment.

Once installation of the fibre optic cable is complete a series of tests to be agreed with the Employer shall be carried out to ensure the satisfactory operation of the cable. The tests shall be carried out in both directions.

The tests, using an optical time domain reflectometer (OTDR), shall include but not be limited to:

- **Optical attenuation on the terminated cable in both directions carried out at the wavelengths given in Technical Schedules.**
- **Loss distribution to measure the uniformity of loss in the fibre and joint losses.**
- **End to end attenuation tests including connectors at terminal stations prior to commissioning.**
- **Bit Error Rate (BER) test shall be carried out and the error rate shall not exceed 10⁻⁹.**

On completion of the tests three copies of the test reports shall be supplied to the Employer.

At the end of the guarantee period the optical attenuation of the cable between terminal stations complete with end connectors shall be re-measured and recorded and it shall not be more than 0.22 dB/km @1550nm (G.652.D) and 0.30 dB/km @1550nm (G.655) at the commissioning; increase over the guarantee period ≤ 0.02 dB/km over the guaranteed period); OTDR bi-directional @1330/1550 nm.. BER tests shall also be repeated.

4.5.5.3 Sample tests

Samples from 10% of lengths of the finished OPGW shall be taken, the metallic strands subjected to tests stated in relevant EN standard and optical fibres subjected to attenuation and dispersal tests in accordance with IEC. In the event of a sample from any length not passing these tests a second and third sample shall be taken from the same length and if one of these also fails under test the length from which it has been taken shall be rejected. This shall be demonstrated during FAT.

4.5.5.4 Marking of Fibres

The Contractor shall give information about:

- **Number of tubes**
- **Number of fibres in each tube**
- **Colour codes**

The colour shall have good-fast property and shall comply with the colours specified in IEC 60304. The colour coding method shall be submitted to the Employer for approval.

The original colour coding system shall be visible or discernible throughout the design life of the OPGW.

Colouring utilized for colour coding optical fibres shall be integrated into the fibre coating and shall be homogenous. The colour shall not bleed from one fibre to another and shall not fade during fibre preparation for termination or splicing. The optical fibre colour code to be used shall be as stated in the Technical Schedules.

4.5.5.5 Maximum Working Tension and Ultimate Tensile Strength.

Maximum working tension (MWT) shall be calculated for maximum allowable sag of 2% on nominal span lengths and under the wind conditions specified in the Technical Schedules.

Ultimate Tensile Strength (UTS) of the optical fibre cable shall be designed to exceed 2.5 times the maximum working tension.

4.5.6 OPGW Fittings

4.5.6.1 General

All fittings shall be designed in such a way that no degradation of the optical transmission in the fibres of the wire occur for all service conditions. The optical fibres shall be freely moveable in the wire under service load.

Suspension towers shall be provided with the facility to accommodate suspension and tension clamps and bonds.

4.5.6.2 Tension Clamps

The tension set shall consist of a line guard and preformed dead end which is placed on the line guard. The line guard shall be laid in the opposite direction to the outer layer on the OPGW and the dead end must be laid in the opposite direction to the line guard.

The length of the line guard shall be sufficient to install vibration dampers. It shall protect the OPGW against concentrated radial forces in the region of contact between the dead end and the OPGW. All helical rods shall be made of aluminium or aluminium-clad steel. The tension set shall withstand at least 95% of the OPGW’s rated ultimate strength.

At tension towers the earth conductor clamps shall each be securely bonded to the tower steelwork by means of suitable lengths of multistrand aluminium flexible bond wires having a cross-sectional area adequate to carry a current of 25 kA for not less than one second. The bond shall be terminated with compression lugs.

4.5.6.3 Dead End Clamp Assembly

The Contractor shall furnish a complete assembly to dead end the OPGW to the transmission dead end and terminal structures consisting of an approved dead-end clamp, the necessary hardware components to link the dead-end clamp to the supporting structure and the jumper assembly to bond and ground the OPGW to the structure. Dead end clamps shall be of the type specified in the Technical Schedules and shall be of such design and material capable of developing after installation a minimum of 95% of the rated breaking strength of the OPGW and shall not permit slippage of the shield wire in the gripping section. The dead-end clamps shall be capable of carrying the maximum current for which the OPGW is designed without causing overheating or loss of mechanical strength. Dead end clamps shall allow the OPGW to be continuous through the clamp without cutting and splicing. The hardware linkage to connect the dead-end clamp to the supporting structure shall be galvanized steel with stainless steel centre bolt with nut, stainless steel cotter key and galvanized steel connecting plate. The grounding jumper assembly shall be provided with a tight-fit aluminium alloy parallel groove bolted clamp for the OPGW end and one-bolt galvanized steel clamp for the structure end. The Contractor shall also supply insulated dead-end assemblies for road, railway, other overhead powerline and pipeline crossings and the terminal structure into/out of each substation as appropriate, and also where required by the Employer. On insulated strain towers the down-lead shall be insulated from the tower using insulated clamps. On non-insulated strain towers the down-lead shall be electrically connected to the tower by means of non-insulated clamps.

4.5.6.4 Suspension Clamp

Suspension clamps for optical fibre (OPGW) earth conductors shall be free to pivot in the vertical plane about a horizontal axis passing close to and transverse to the centre line of the conductor. The conductor shall be mechanically clamped in an approved manner. Suspension clamps shall permit controlled axial movement of the conductor through the clamp without causing damage to the conductor under unbalanced load conditions. The tension unbalance at which this slippage can occur shall be approximately 15% of UTS. Unless otherwise approved, the suspension clamp unit shall be designed such that there is progressive stiffening of the optical fibre conductor up to the suspension clamp, which is a point of maximum bending. Complete protection of the optical fibres from damaging radial crushing loads under the clamp shall be ensured by the use of a suitable armoured suspension

clamps, of either the Armour Grip Suspension (AGS type with Armour Rods and an internal elastomeric clamp liner) or an armoured metallic suspension clamp which is specially designed for the specific size OPGW and incorporates armour rods and positive metallic ‘stops’ in the suspension clamp body. Suspension clamps for OPGW earth conductors shall be designed for attachment of a required flexible earthing bond that is to be bolted between each suspension clamp and the tower steelwork.

At suspension towers the earth conductor suspension clamp shall be securely bonded to the tower steelwork by means of a multistrand aluminium flexible bond wire having a cross-sectional area adequate to carry a current of 25 kA for not less than one second. The bond shall be terminated with compression lugs and shall not interfere with the suspension clamp movement.

4.5.6.5 Dampers

The optical fibre earth conductor (OPGW) shall be fitted with approved vibration dampers, Stockbridge type of four response format using 19 strand minimum messenger cable.

The earth conductor vibration dampers shall be designed to:

- a. introduce an additional damping effect to that of the earth conductor and to control aeolian vibration to ensure that the strain level in the earth conductors at the clamps, both suspension and tension, is below the fatigue limit of the earth conductor strands,
- b. guarantee that the earth conductor bending strain at suspension and tension clamps shall not exceed the limit of 150 microstrains.

Successful service history of the proposed damping system in environments at least as hostile as that for the present project shall be demonstrated and the efficacy of the proposed system for damping aeolian vibrations shall be demonstrated by calculation, as detailed below.

The metallic material of vibration damper clamp shall be aluminium alloy. The clamp shall be provided with an adequate clamping surface secured by bolt and with a radius at the clamp mouth to prevent damage to the conductor. Alternative designs of clamping (armour grip) can be considered on evidence of satisfactory service experience. All screws and nuts shall be of stainless steel and shall be locked in an approved manner.

The number of dampers per span of individual earth conductor shall be as stated in the Technical Schedules.

The approval of vibration dampers shall be conditional on the provision of evidence of satisfactory service life and performance. Evidence must be provided in respect of fatigue resistance, clamp to conductor grip and damping of aeolian vibration with disposition along the span as recommended by the manufacturers. Evidence shall be provided of resistance to ozone and the ultraviolet light as well as to aging in the case of spiral vibration dampers.

In order to evaluate the efficiency of the damping system the supplier must have developed suitable computer programmes that have been verified against experimental investigations and behaviour of actual transmission lines, so that he is able to simulate the behaviour of the earth conductor when subjected to wind-excited aeolian vibration.

Based on the type of conductor and its tensile load the supplier shall submit a damping study, with calculations of vibration amplitude and strain on earth conductors with and without vibration dampers.

Stockbridge type vibration dampers shall satisfy the requirements specified in the Tests section of the Technical Specification and in IEC 61897.

4.5.6.6 Joint Boxes and Splices for Optical Fibre

Each joint shall include its joint box and mounting hardware, optical fibre splice kits, entry seals and all accessories required to produce a permanent optical joint. Details of the proposed optical fibre joints shall be submitted by the Contractor for the approval.

All fibre joints shall be individually mounted within the box. Optical fibre splices shall be of the fusion type and optical attenuation of each splice shall be less than 0.1dB.

Variations in the quality of workmanship in making the fusion splice shall have a minimal effect on the efficiency and reliability of the joint.

Joint boxes designed to protect all optical fibre joints from the environment shall be provided and located on appropriate joint towers above the anti-climbing devices. Joint towers may be either tension or suspension towers, the latter being specifically modified to accept the optical termination fittings. Each joint box shall be capable of being hermetically sealed after jointing and hermetically resealed after reopening and reclosing.

The boxes, which shall be fitted with a bolted and lockable lid, shall be manufactured from stainless steel and shall provide protection to Class IP 66 of IEC 60947-1. Integral earth terminal shall be provided. The box shall be made weatherproof by the use of corrosion-resistant sealing compound.

Access on the bottom edge of the box shall be by means of weather-tight glands sized for the incoming and exiting OPGW earth conductor, plus facility for one additional optical fibre cable.

The joint boxes shall provide adequate protection for splices and shall provide storage for sufficient length of fibre. The size of the boxes shall be sufficient to meet the minimum physical storage redundancy of 100% (up to 8 cassettes, 12 fibres each).

The boxes shall be securely clamped to the tower. Due account shall be taken of the weight and wind area of the joint box and its effect on the design of the towers.

Each box shall be labelled “**Keep Off – Danger of Death**” in English language.

The OPGW earth conductor shall be supported on and electrically bonded to the structure by means of cleats at 1000 mm centres on vertical members and 600 mm centres on horizontal members. The cleats shall be designed so that no damage during installation is caused to the galvanized surface of the steelwork.

The location of the boxes shall be 7.0 m above ground level. To permit the joint box to be moved to the ground for jointing purposes a suitable length of OPGW earth conductor, minimum 20 m, is to be coiled and supported on the structure as specified before entering the joint box.

All required materials for fixing the OPGW earth conductor and for the installation of the joint boxes shall be supplied by the Contractor and the costs for these materials and joint boxes shall be deemed to be included in the cost of the OPGW earth conductor, as shall the costs for carrying out all the necessary jointing and splicing.

4.5.6.7 Splice Box

The fibre optic cable (OPGW) shall be joined in splice boxes located on the tower legs or pole body at the locations where the OPGW is dead ended. The fibre optic leads shall be brought down and up the towers on the inside of the tower legs supporting the splice box.

The splice box shall be of the corrosion resistant metallic material and watertight. The box shall be able to contain trays for the required number of fibres **specified in the Technical Schedules.**

The splice box shall be equipped with a locker and shall be designed for direct mounting to the tower. The splice box shall include the mounting hardware, optical fibre splice kits, OPGW and/or cable entry seals and all accessories for a permanent optical joint.

Splice boxes for transmission line towers shall be designed for connection of two optical fibre ground wires. Splicing boxes for the gantry towers of the substation shall be designed for connection of one optical fibre ground wire and one optical fibre feeder cable.

The OPGW leads shall be attached to the tower at 1.0 m interval by double groove aluminium alloy clamps specifically designed to accommodate the diameter of the composite fibre optical ground wire. The splice box shall be installed on the towers at a height of approximately 5 meters (min.) from the ground. The OPGW leads shall be laid in a loop at the tower side. The length of the OPGW leads shall be such that the splicing can be made on the ground 10 meters from the tower.

The splicing shall be made by fusion welding. The attenuation in any single splice shall be less than 0.20 dB at 1550 nm with an average value of maximum 0.15 dB and at 1310 nm less than 0.25 dB and 0.20 dB, respectively.

The Contractor shall submit with the bid complete information regarding the splice boxes and the method and equipment to be used for mounting, splicing and testing.

If necessary, Splice Box, OPGW loops and all clamps to tower will be insulated to that tower, where, according to the Technical Specification, OPGW should be isolated.

The Splice Boxes shall be installed only on self-supported towers.

4.5.7 Marking

The following information shall be clearly marked in indelible paint on both flanges of every conductor drum in English:

- Type of OPGW and code name.
- Size of conductor + number of fibres.
- Exact length in meters.
- Serial number if applicable
- Net weight in kg.
- Gross weight in kg.
- Drum number.
- Manufacturer’s name and country of origin.
- Year of manufacture.
- Purchaser’s order number.
- Shipping destination.
- Rotation arrow

4.5.8 Packing

Packing and crating methods are the responsibility of the Contractor.

The conductor shall be shipped in matched sets of eight in nominal standard lengths on non-returnable wooden or steel reels. The reels shall be designed for normal tension stringing operations.

The drums of the conductor reels shall be wrapped with a moisture resistant protective covering. The inner flanges of the reels shall be lined with moisture resistant solid fibreboard.

The two outer layers of conductor shall be interleaved, and the outer layer covered with moisture resistant paper. A protective covering of a single layer of moisture resistant solid fibreboard, secured with steel banding, shall be wrapped overall. The reels shall be so constructed to withstand normal loads due to tension stringing operations and they shall be sufficiently sturdy to withstand the additional handling inherent to ocean shipment.

The reels shall be wood lagged, the lagging to be secured with two steel bands. The steel bands shall be intermittently stapled to the lagging. The Contractor shall submit drawings of reels for approval.

Hardware and fittings shall be packed in sturdy wooden cases suitable for both ocean and inland transportation and shall be clearly marked with the following information:

- Description of the items.
- Number of pieces.
- Net weight and gross weight.
- Manufacturer’s name and country of origin.
- Year of manufacture.
- Purchaser’s order number.
- Shipping destination.

4.5.9 Submittals

Submittals required with tender include:

- The Technical Data Schedules for conductor offered.
- Installation methods and materials.
- Jointing methods, materials and mounting arrangements.
- Physical protection against the ingress and transmission of moisture.
- Identification marking and fibre coding.
- The manufacturer’s quality assurance program and/or manual together with a list of international/national standard specifications covering raw materials, components, processes, tolerances, test procedures, etc. and a list of tests normally carried out on raw materials and a description of test equipment used.
- A full list of routine and sample tests carried out during and after manufacture and a description of the test equipment used.
- A full list of all type tests performed and all relevant data confirming results.
- Detailed drawings of each type of drum that will be used for packing

Submittals required following award of the contract:

- Details of manufacturing, test and shipping schedules and transportation/delivery proposals.
- Certificates covering raw materials used in the manufacture of conductors.
- Certificates covering routine tests carried out on wires before stranding of conductors.
- Certificates covering the sample tests carried out on wires after stranding and type tests on complete conductor before shipping of conductors.
- Curves of creep versus load and time.
- OPGW short-circuits temperature curves giving current versus time.
- A list giving per drum, the drum number, the size of conductor, the exact length, the net weight, the gross weight, the number of any joints made during stranding and their distance from the out end.

4.5.9.1 Sag/Tension Data

The Contractor shall furnish the initial and final Sag-Tension Charts and data for the specified OPGW based on the Stress-Strain and Creep test conducted under this specification. Calculations shall be submitted to the Employer for approval. The OPGW sag shall not exceed 90% at 25°C (theoretically calculated sag) of the final sag of the conductor at the no wind loading condition. In addition, if a companion standard overhead earth wire is installed in the same tower, the sags of both the optical ground wire and standard overhead earth wire shall match the same no wind final condition at Everyday Stress Temperature, within 10 cm tolerance.

4.5.9.2 Tools

The Contractor shall furnish a list of special tools aside from those **mentioned in the Technical Schedules**, identifying the function of each tool and the specific items for which it is used.

The Contractor shall also provide instructions for the proper operation, maintenance and calibration of all tools furnished, including instructions for proper storage.

If comealongs are required in the installation, the Contractor shall supply such tools and its pertinent information. If, in the opinion of the Contractor, the specified comealongs are not adequate to properly hold the specified cable(s), the Contractor shall offer the appropriate comealongs and provide an explanation **in the Technical Schedules**. The Contractor shall provide instructions for the proper use, maintenance and storage of the comealongs.

4.6 Insulators and Hardware for Conductor, Aluminium Clad Steel and Aluminium Conductor Steel Reinforced 95/55 Shield Wires (OHL)

4.6.1 General

This specification covers the detailed requirements for the design, manufacturing, test, shipping and installation of insulators and hardware assemblies for use with the conductor and the aluminium clad steel shield wire. Insulators and hardware assemblies shall be furnished in accordance with the details shown on the drawings and the requirements hereafter described.

The following items are covered under these specifications:

- Insulators for conductor suspension, dead-end and jumper support assemblies.
- Hardware for attaching insulators to towers and for attaching insulators to conductors.
- Hardware for attaching aluminium clad steel conductor shield wire to towers.

4.6.2 Standards

All equipment and material, as well as fabrication testing thereof to be provided by the Contractor shall comply with the latest following standards and drawings:

EN ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles.
IEC 60060	High voltage test techniques
IEC 61211	Insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000 V. Impulse puncture testing in air
IEC 60120	Dimensions of ball and socket couplings of string insulator units
IEC 60507	Artificial pollution tests on high-voltage ceramic and glass insulators to be used on a.c. systems
IEC 61284	Overhead lines – Requirements and tests for fittings
IEC 60305	Characteristics of string insulator units of the cap and pin type
IEC 60372	Locking devices for ball and socket couplings of string insulator units
IEC 60383	Test on insulator of ceramic material or glass for overhead lines with a nominal voltage greater than 1000 V
IEC 60437	Radio interference test on high-voltage insulators
IEC 61467	Insulators for overhead lines. Insulator strings and sets for lines with a nominal voltage greater than 1000 V. AC power arc tests
BS EN 60372	Locking devices for ball and socket couplings of string insulator units. Dimensions and tests
IEC 60575	Thermal-mechanical performance test and mechanical performance test on string insulator units
IEC 60797	Residual strength of string insulator units of glass or ceramic material for overhead lines after mechanical damage of the dielectric
IEC 60120	Standard coupling size
CIGRE Paper 33-204	Session 2000, Considerations on the Design of Composite Suspension Insulators Based on Experience From Natural Ageing Testing and Electric Field Calculations
CIGRE Technical Brochure 184	Composite Insulator Handling Guide
CIGRE Technical Brochure 365	Use of power arc protection devices for composite insulators on transmission lines
CIGRE Technical Brochure 284	Use of corona rings to control the electrical field along transmission line composite insulators
CIGRE Technical Brochure 255	Material properties for non-ceramic outdoor insulation.
ISO 9001	Quality System Model for Quality Assurance in Design/ Development, Manufacture and Testing
ISO 9002	Quality System Model for Quality Assurance in Production, Installation and Servicing

4.6.3 Insulator Strings and Insulator Units

4.6.3.1 Strings

Suspension and tension string tower attachments shall be of the ‘hinge’ type. U-bolt or shackle attachment type shall not be allowed. Use of turnbuckles, except for specific “downlead” strings, shall not be allowed.

A double tension insulator set shall be used as default tension insulator set for tension towers, except for 132kV, where single tension insulator shall be used.

330kV and 400kV insulators shall be toughened glass and 132kV insulators shall be composite.

The double tension insulator set shall be orientated in the horizontal plane and shall be designed for double point tower attachment. In order to enable the installation of tension insulator sets, double point attachments for all tower cross arms shall be provided.

Tension insulator sets shall be equipped with sag-adjusting plates, links or other devices to provide a total range of longitudinal adjustment from plus to minus 150 mm in steps not greater than 25 mm.

Tension insulator sets shall be equipped with triangular frame yoke plate on live side of the string.

Tension insulator sets and clamps shall be arranged to give a minimum clearance of 150 mm between the jumper conductor and the rim of the live end insulator units.

Spacing between double strings shall be sufficient to prevent clashing of adjacent insulator units.

Double insulator strings shall be designed to ensure that following the breakage of one insulator string, the set shall remain intact and withstand the resulting static and dynamic loadings imposed.

All insulators and insulator sets shall comply with the technical requirements of the Technical Schedules.

All insulator sets including their clamps and fittings shall, in fair weather, be free from corona discharges. This shall be proven by test. An extinction corona voltage at least 5% higher than the phase-to-earth value of the specified highest voltage for equipment shall be obtained.

All insulator sets must be equipped with all necessary shield devices in order to keep their radio and television noise as low as possible. The radio interference (RI) performance of the insulator sets shall be proven by test. A noise level less than 45 dB above 1 microvolt at 10kV must be ensured for 330kV & 400kV and less than 35dB at 1 μ V for 132kV.

The single suspension insulator set shall be used as the default suspension insulator set for 400kV and 330kV suspension towers. The double suspension insulator set shall be used for significant crossings only.

4.6.3.2 Fittings

All connecting fittings between the conductor and the tower steelwork such as a hinge to tongue, clevis to tongue or link which are subject to a tensile load in service shall comply with IEC 61284 except that each fixing pin shall be secured by a threaded nut and a split pin. A backing washer is not required, and the unthreaded shank of the fixing pin shall extend 3 mm through the clevis or hinge. The nut shall, during the erection, be tightened to the end of the thread and be backed by a phosphor bronze or austenitic stainless steel split pin. A clevis or hinge opening shall not exceed the thickness of the corresponding tongue, plate or link by more than 3 mm. Adequate bearing area between fittings shall be provided and point contacts shall be avoided wherever this is possible without adversely affecting the flexibility of the fitting.

Fittings made of steel or malleable iron shall be galvanized in accordance with the Specification. All bolts and nuts shall comply with the requirements for tower bolts and nuts and shall, unless otherwise specified, be locked by locknuts. The mechanical strength of the fittings shall be as stated in the Technical Schedules and the minimum failure load of each fitting shall be stated on the drawings. All clamps and fittings (except arcing rings) which may be the subject to direct or indirect lightning or short circuit current shall withstand at least 31.5kA (132kV) and 40kA (330 and 400kV) for one (1) second (phase conductors) or 25kA for 0.5 seconds (ACS shield wires) without alteration of their electrical or mechanical performance values.

Fittings shall be provided in all insulator-sets to allow live line replacement of insulator units to be carried out. Insulator sets shall be fitted with shouldered extension links at each end of the insulator strings, suitable for standard strain carrier yokes of live line maintenance equipment. An attachment plate behind the tension clamp shall be provided to enable the load on the tension set to be relieved when making adjustment to the sag-adjusting links.

All yoke plates, if used, shall be rigidly constructed and shall withstand the maximum vertical, transverse and longitudinal forces applied simultaneously or separately without sign of deformation. Yoke plates in suspension string shall be designed to permit swings of the conductor clamps to angles of at least 90° from the vertical. The attachment of a yoke plate to a vertical string of suspension insulators shall be by means of a single bolt allowing the conductors to swing transversely. Each string comprising an insulator set shall be separately bolted to a yoke plate. Provision shall be made in the manufacture of yoke plates for attaching 200 kg of counterweights.

4.6.3.3 Arcing rings & Corona devices

Arcing rings and other corona shield equipment, formed from galvanized mild steel and of approved types, shall be attached in an approved manner to all suspension and tension insulator sets. The devices shall be attached to the insulator fittings, but not directly to conductor clamps or to the caps of insulator units. The design of the devices shall be such as to reduce, as far as reasonably possible, damage to the phase conductors, clamps, insulator strings and devices themselves under all flashover conditions. The general shape and method of attachment of the live end device shall also not restrict the replacement of insulators under live line conditions.

The arcing rings of the insulator sets must fulfil simultaneously the functions of arcing rings, corona shield and potential distribution devices. As an arcing device, the guard rings shall be designed to protect insulators and conductors when flashover occurs. The arcing fittings shall be made of hot dip galvanized steel and must have the capability to withstand a short circuit current of 31.5kA (132kV) and 40kA (330 and 400kV) for 1 sec.

The arcing fittings must be designed such that in case of a flashover the arc will be led to the end burning spot. They may reach a final temperature not exceeding 600°C during short-circuit. The function of arcing protection must not be greatly altered by the power arc.

As corona shield devices, the arcing rings shall be designed to ensure a corona-free insulator and string set.

As potential distribution devices, the arcing rings must be designed to ensure that for each insulator a potential value as required by the insulator manufacturer is ensured.

The design of the arcing rings shall consider and optimize simultaneously all the functions required. The rings shall be strong enough to support a maximum point load of 90 kg.

All suspension and tension insulator sets for the general run of lines shall be provided with arcing rings at both line and earth ends.

4.6.3.4 Suspension clamps*ACSR Conductor and earth wire*

Suspension clamps for ACSR phase conductor and earth wire shall be free to pivot in the vertical plane about a horizontal axis passing through and transverse to the centre line of the conductor. Suspension clamps shall permit the complete conductor to slip at approximately 15% of the UTS tension stated in the Technical Schedules, but the conductor shall be mechanically clamped in an approved manner.

To provide protection of the phase conductor from damaging bending stresses and fatigue at the suspension clamp the use of a suitable armoured suspension clamp, of either the Armour Grip Suspension (AGS type with Armour Rods and an internal elastomeric clamp liner), standard oscillating type suspension clamp with additional armour rods or an armoured metallic suspension clamp (line guard suspension clamp) which is specially designed for the specific conductor size and incorporates armour rods and positive metallic ‘stops’ in the suspension clamp body. Elastomers or other non-metallic materials used in suspension clamps shall have good resistance to ageing and be capable of withstanding temperatures between +0°C and +110°C without change of essential properties. The materials shall have adequate resistance to the effects of ozone, ultraviolet radiation and air pollution over the entire temperature range.

Suspension clamps for pilot/auxiliary suspension strings for ACSR phase conductors shall be of standard oscillating type and shall not use amour rods. The supporting groove beyond the clamp shall be curved in the vertical plane to allow for the conductor leaving the clamp at the maximum inclination to be obtained in service. The mouth of the supporting groove shall also be slightly flared in plan. The grooves in the clamping piece or pieces shall be bell-mouthed at each end. All conductor grooves and bell-mouths in ferrous clamps shall, after galvanizing, be smooth and free from waves, ridges or other irregularities. Use of cushion clamps (without armour rods) is acceptable.

ACS earth wire

Suspension clamps for ACS earth conductors shall be of standard oscillating type and shall not use amour rods. The supporting groove beyond the clamp shall be curved in the vertical plane to allow for the conductor leaving the clamp at the maximum inclination to be obtained in service. The mouth of the supporting groove shall also be slightly flared in plan. The grooves in the clamping piece or pieces shall be bell-mouthed at each end. All conductor grooves and bell-mouths in ferrous clamps shall, after galvanizing, be smooth and free from waves, ridges or other irregularities.

4.6.3.5 Tension clamps*Phase Conductor*

Tension anchor clamps for ACSR conductors and earth wire shall be of the compression type and shall comply in all respects with the provision of the Specification for phase conductor joints where applicable to either the tension or non-tension components. The mechanical efficiency of such tension clamps shall not be affected by methods of erection involving the use of auxiliary erection clamps before, during or after assembly and erection of the tension clamp itself.

ACS earth wire

Tension anchor clamps for ACS earth conductors shall be of the compression type and shall comply in all respects with the provision of the Specification for phase conductor tension clamps where applicable.

4.6.3.6 Insulator units toughened glass 400kV and 330kV

Insulator units for suspension strings shall be fog shaped insulators designed to minimize the adherence of dust and other solids. Insulator units for tension strings shall be fog shaped type. The insulators shall be of the cap and pin type, shall be of toughened glass and shall be the type of insulator specified here-under.

Cap and pin insulators shall be provided with ball and socket fittings in accordance with IEC 60120 and “W” or “R” type security clips for the insulator units themselves, in accordance with IEC 60372.

The locking devices shall be so formed that when set and under any conditions there shall be no risk of the locking device being displaced accidentally and that nothing, but extreme deformation of the locking device shall allow separation of the insulator units or fittings. Locking device design shall be such as to allow easy removal or replacement of the insulator units or fittings under live line conditions. Locking devices when in position shall be independent of rotation, and the efficiency of the locking shall be independent of the degree of opening applied to the locking device after insertion. The locking device shall be of austenitic stainless steel or phosphor bronze and of the same design for all the complete insulator sets.

Cap and pin insulators shall be provided with a pure zinc anti-corrosion sleeve, bonded to the surface of the pin and extending at least 12 mm on either side of the interface between pin and internal cement. The material of the sleeve shall be pure zinc, with impurities not exceeding 0.3 %. The zinc sleeve shall not be porous. A suitable metallurgical bond is required between sleeve and pin; the fused area between them shall be in excess of 80 % of the total interfacial area between the sleeve and the pin.

4.6.3.7 Insulator units composite 132kV

Insulator units for suspension and tension insulator strings shall be of composite type. The insulators shall be of the cap and pin type.

Cap and pin insulators shall be provided with ball and socket fittings in accordance with IEC 60120 and “W” or “R” type security clips for the insulator units themselves, in accordance with IEC 60372.

The locking devices shall be so formed that when set and under any conditions there shall be no risk of the locking device being displaced accidentally and that nothing, but extreme deformation of the locking device shall allow separation of the insulator units or fittings. Locking device design shall be such as to allow easy removal or replacement of the insulator units or fittings under live line conditions. Locking devices when in position shall be independent of rotation, and the efficiency of the locking shall be independent of the degree of opening applied to the locking device after insertion. The locking device shall be of austenitic stainless steel or phosphor bronze and of the same design for all the complete insulator sets.

Cap and pin insulators shall be provided with a pure zinc anti-corrosion sleeve, bonded to the surface of the pin and extending at least 12 mm on either side of the interface between pin and internal cement. The material of the sleeve shall be pure zinc, with impurities not exceeding 0.3 %. The zinc sleeve shall not be porous. A suitable metallurgical bond is required between sleeve and pin; the fused area between them shall be in excess of 80 % of the total interfacial area between the sleeve and the pin.

4.6.4 Insulator Strings and Insulator Units Characteristic

The dimensions and characteristics of insulator units shall be in accordance with the following specifications:

4.6.4.1 Insulator Units

Insulator Unit	Units	Data 400kV	Data 330kV
SUSPENSION STRING INSULATOR UNIT			
Standard		IEC 60305	IEC 60305
Nominal Line Voltage	kV	400	330
Highest System Voltage	kV	420	362
Coupling		Ball and Socket	Ball and Socket
Type		Fog profile glass insulator	Fog profile glass insulator
Nominal disc diameter	mm	280	280
Unit spacing	mm	146	146
Minimal nominal creepage distance per disc	mm	450	450
Dimension fittings	IEC	16A	16A
Related electro-mechanical strength	kN	120	120
Mechanical Routine Test Load	kN	60	60
Power frequency dry withstand	kV	IEC 60383	IEC 60383
Power frequency wet withstand	kV	IEC 60383	IEC 60383
Dry impulse withstand voltage	kV	140	140
Min. puncture voltage	kV	130	130
Sacrificial zinc sleeve on pin		YES	YES
TENSION STRING INSULATOR UNIT			
Standard		IEC 60305	IEC 60305
Nominal Line Voltage	kV	400	330
Highest System Voltage	kV	420	362
Coupling		Ball and Socket	Ball and Socket
Type		Fog profile glass insulator	Fog profile glass insulator
Nominal disc diameter	mm	330	330
Unit spacing	mm	170	146
Minimal nominal creepage distance per disc	mm	525	450
Dimension fittings	IEC	20	20
Related electro-mechanical strength	kN	210	160
Mechanical Routine Test Load	kN	105	80
Power frequency dry withstand	kV	IEC 60383	IEC 60383
Power frequency wet withstand	kV	IEC 60383	IEC 60383
Dry impulse withstand voltage	kV	145	145
Min. puncture voltage	kV	130	130
Sacrificial zinc sleeve on pin		YES	YES

4.6.4.2 Insulator Strings

Note: The 400kV OHTL between 330kV Nakonde stepdown S/S and Tanzania border will be operated at 330kV, thus suitable arcing horns shall be fitted on the 400kv OHTL.

Suspension String	Units	Data 400kV	Data 330kV
No. of units per string		29	22
Total creepage	mm	13050	9900
Arcing distance	mm	3900	2900

Suspension String	Units	Data 400kV	Data 330kV
Lightning impulse withstand Voltage pos/neg	kV	1550	1245
Switching Impulse withstand (wet) Voltage	kV	1050	1010
Wet power frequency withstand Voltage	kV	610	580
Corona Inception Voltage	kV	>270	>230
Radio interference Voltage	kV	220	220
Radio interference	dB/1μV	45	45
Electro-mechanical failing load	kN	120	120
Creepage distance (IEC60815) USCD	mm/kV	(e) 53,7	(d) 43,3
Tension String	Units	Data 400kV	Data 330kV
No. of units per string	No.	2 X 29	2 X 22
Total creepage	mm	15225	9900
Arcing distance	mm	3900 2900*	2900
Lightning impulse withstand Voltage pos/neg	kV	1550	1245
Switching Impulse withstand (wet) Voltage	kV	1050	900
Wet power frequency withstand Voltage	kV	610	580
Corona Inception Voltage	kV	>270	>230
Radio interference Voltage	kV	220	220
Radio interference	dB/1μV	45	45
Electro-mechanical failing load	kN	2*210	2*160
Creepage distance (IEC60815) USCD	mm/kV	(e) 53,7	(d) 43,3

* ≥2 km out from Nakonde Step Down Substation

4.6.4.3 132kV Insulator String

Suspension and Tension String	Units	Data 132kV
Standard		IEC 61109
No. of units per string		1
Total creepage	mm	3625
Arcing distance	mm	1200
Nominal Voltage	kV	132
Highest System Voltage	kV	145
Lightning impulse withstand Voltage pos./neg.	kV	650
Wet power frequency withstand Voltage	kV	275
Corona Inception Voltage	kV	>230
Radio interference Voltage	kV	220
Radio interference	dB/1μV	45
Electro-mechanical failing load	kN	120
Creepage distance (IEC60815) USCD	mm/kV	(d) 43,3

4.6.5 Tests

4.6.5.1 Insulator Units

Type tests

The manufacturer has to submit a test certificate and test report from recognizable and accredited laboratory that the insulator unit pass the type test according to IEC 60383.

The manufacturer has to submit a test certificate and test report from recognizable and accredited laboratory that the insulator unit pass the impulse voltage puncture in air test according to IEC 61211.

The manufacturer has to submit a test certificate and test report from recognizable and accredited laboratory that the insulator unit pass the RIV test according to IEC 60437 with result not worse than 45dB@10kV for 330kV & 400kV and not worse than 35dB@10kV for 132kV.

Routine tests of insulator units

Routine tests shall be carried out in accordance with IEC 60383-1.

Sample tests of insulator units

Sample tests including sample size shall be carried out in accordance with IEC 60383-1.

4.6.5.2 Insulator sets

Type test of complete insulator set shall follow IEC 60383-1

- Dry lightning impulse withstand voltage test (up-down method)
- Wet power frequency withstand voltage test
- Wet switching impulse withstand voltage test
- Corona onset test (IEC 60060-1)
- Radio interference test. (IEC 60437)

Type tests of insulator string fittings

All insulator string fittings shall pass the type test and sample tests in accordance with IEC 61284.

Type tests of conductor clamps

All insulator conductor clamps (suspension and tension) shall pass the type test and sample tests in accordance with IEC 61284 with the additional conditions for type tests as follows:

- Non-destructive testing is not compulsory.
- Magnetic loss testing is not compulsory
- Hot dip galvanizing test is compulsory.
- Corona & RIV test is compulsory – these tests may be carried out simultaneously with the insulator set tests if this is found to be convenient.

4.6.6 Marking

4.6.6.1 Insulators

Each insulator unit shall be legibly and indelibly marked with the name and trademark of the manufacturer, the year of manufacture and the SML (specified mechanical load) in accordance with IEC 61109 and IEC 60383.

4.6.6.2 Hardware

Each fitting shall be legibly and indelibly marked with the logo of the manufacturer, the year of manufacture and the SML (if applicable).

4.6.7 Packing

Insulators shall be packed in sturdy wooden crates with outer plastic packaging suitable for both ocean and inland transportation and shall be clearly marked with the information stated below. In addition to this, each individual insulator for composite insulators should be encased in crush proof protective sleeve.

Hardware and fittings shall be packed in sturdy wooden cases suitable for both ocean and inland transportation and shall be clearly marked with the following information:

- Description of the items.
- Number of pieces.
- Net weight and gross weight.
- Manufacturer’s name and country of origin.
- Year of manufacture.
- Purchaser’s order number.
- Shipping destination.

4.6.8 Submittals

Submittals to be included in the Bid:

- The technical data schedules of this specification.
- A detailed program of the tests to be carried out at the works, during manufacture.
- Type test certificates of the insulators.
- Detail drawings of the insulators with all mechanical and electrical characteristics, description of materials, unit weight, etc..
- Dimensioned drawings of each string type inclusive of its entire complement of fittings.
- Dimensioned drawings of each piece of equipment with indications of net weight, material used and mechanical failing loads (where relevant).
- Descriptions of locking devices to prevent loosening of bolts.

Submittals required following the award of the contract are four copies of:

- Reports of all tests during manufacture; including certificates or specialist test laboratory reports analysis giving full particulars and demonstrate full compliance of all mechanical, thermal, electromechanical and electrical performance of insulators as specified and all vendor details drawings.
 - Test reports of all tests during manufacture and, as appropriate, of specialist tests of line fittings and conductor accessories were tested as part of an overall assembly (e.g. complete insulator string).
 - Final drawings of insulators, all line fittings and conductor items, special tools and equipment supplied, as individual components and complete assemblies as appropriate.
-

4.7 Overhead Line Accessories

4.7.1 General

This specification covers the detailed requirements for the design, manufacturing, testing and shipping of the following phase conductor, ACSR 95/55 and ACS shield wire accessories.

- Mid span joints and dead-end.
- Conductor repair sleeves.
- Armour rods.
- Dampers.
- Spacer.
- Jumper Spacer.
- Aircraft warning sphere.
- Bird Flight Diverters (as per ESIA).
- Bird Tracings.

4.7.2 Standards

All equipment and material, as well as fabrication testing thereof to be provided by the Contractor shall comply with the latest following standards:

EN ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles.
IEC 61284	Overhead lines – Requirements and tests for fittings
IEC 61854	Overhead lines – Requirements and tests for spacers
IEC 61897	Overhead lines – Requirements and tests for Stockbridge type Aeolian vibration dampers
IEC 60437	Radio interference test on high-voltage insulators
IEC 60060	High voltage test techniques

4.7.3 Materials and Workmanship

Conductor and shield wire accessories shall be of the best material suited to meet the mechanical and electrical performances required by this specification. All ferrous metal shall be hot-dip galvanized in accordance with EN ISO 1461.

All threaded steel parts, nuts and locknuts shall be galvanized after threading. Re-tapping of nuts and locknuts after galvanization is permitted, provided that protective zinc or tapping oil remains on the full length of the threads. All nuts and locknuts shall be capable of being turned on the bolt threads on the entire length without use of a wrench.

All cotter pins shall be made of stainless steel and shall be self-locking.

4.7.4 Mid-span Joints, Dead-ends (tension clamps), Jumper Terminals, Repair Sleeves

All mid-span joints, repair sleeves and jumper terminals shall be of the compression type. The ends of compression accessories shall be tapered in such a manner that the pressure will be gradually reduced to zero on that part of the conductor leaving the accessory and that the conductor stresses caused from bending and vibration will be reduced to a minimum.

The mid-span joints shall not permit slipping of, or cause damage to, or failure of the conductor at a load less than 95% of its nominal ultimate strength.

The conductivity of all conductor splice fittings in which the conductor is not continuous shall not be less than 75% of an equivalent length of conductor.

Repair sleeves shall be suitable for repairing accidental minor damage to conductors and shield wires. They shall be used on conductors where not more than two wires of the outer layer are broken and shall only be used for the shield wire to repair damage to the aluminium coating of the wires and shall not be used where the steel portion of a wire is damaged or broken. Use of repair sleeves shall be very limited and may only proceed with prior written acceptance by the Employer.

Repair sleeves shall consist of two interlocking parts of aluminium alloy suitable for compressing over the conductor. The dies used for compressing repair sleeves shall be the same size as those used for compressing the aluminium parts of mid-span joints and dead-ends.

The ferrous parts of mid-span joints and dead-ends shall be adequately protected against corrosion by the use of a rust inhibiting compound and a superimposed aluminium sleeve.

All joints and dead ends shall be fully filled with conductive grease before insertion of the conductor and the surplus of grease shall be wiped out dry after compression.

4.7.5 Armour Rods

Additional armour rods will be used in all phase conductor suspension assemblies in a case of using standard oscillating suspension clamps. This rule does not apply on jumper strings. They shall be of the preformed type and so designed as to protect the conductor from damage due to installation of the suspension clamp, flashover or vibration.

Armour rods for use on the conductors shall be made of aluminium alloy and provided with a centre mark to facilitate cantering during application.

The corona inception voltage of the conductor with the armour rods applied shall not be less than that of the conductor itself.

- Radio interference (RI): less than 45 dB above 1 μ V at nominal voltage systems of 190 and 230 kV r.m.s. voltage value phase-to-earth and less than 35dB at 1 μ V at 76kV voltage value phase to earth.
- Static compression and tensile performance: 5 kN for 1 minute and the separation of the clamps before and after the test shall not differ by more than 5%.
- Impulse compression performance by short-circuit: 32 kA peak with one clamp offset longitudinally by 60 mm (horizontal spacing 450 mm), conductors at everyday tension.
- Longitudinal fatigue performance: 1 million cycles at 1 Hz with a relative displacement of the clamp of + 25mm (450 mm horizontal spacing).
- Vertical fatigue performance: 100 million cycles at 20 Hz with a relative displacement of the clamp of + 20mm.
- Torsional fatigue performances 100 million cycles at 20 Hz with a relative displacement of the clamp up to 2 degrees.
- Clamp slip: max. 1 mm by a load of 2.5 kN applied 1 min.
- Downleads shall be fitted with spacers at a maximum distance apart of 30m.
- Spacers and vibration dampers shall satisfy the requirements specified in IEC 61284, 61854 and 61897 as relevant.

The Contractor shall specify the location of the flexible spacers within various span lengths and the limit of the longest sub-span that will enable the system to meet the requirements of this specification. The data shall be submitted for all type of spans between suspension and tension sections.

Alternative combinations of spacer dampers, with or without end-span Stockbridge dampers, may be adopted providing satisfactory performance data has been offered for the proposed system.

4.7.8 Jumper Spacers

Jumper spacers shall be fitted to maintain 450mm between sub-conductors. They shall be of the rigid type designed to maintain a good electrical connection between the sub-conductors.

Each jumper connection shall be provided with at least two spacers, fitted symmetrically. Additional spacers shall be provided where necessary to ensure that the maximum distance between spacers is 5m.

Jumper spacers shall be so designed as to permit relative torsional and axial movement between sub-conductors without damage. The jumper spacers shall be designed to incorporate weights of up to 500N to reduce the swing of the jumpers.

The clamping device shall be such as to avoid damage to the conductors when tightened or at any time during the service life of the jumper spacer and shall be free from slipping. Jumper spacers shall be capable of being replaced from energized line using hot line tools.

4.7.9 Aircraft Warning Spheres (Shield Wire Marking Spheres)

The Contractor shall provide Aviation Warning Type Markers for installation on the Shield Wire where required along portions of the line and tower paintings for aviation warning where necessary to comply with:

- The relevant ICAO specifications.
- Zambia Civil Aviation Authority (ZCAA) requirements.

Daylight warning spheres shall be fitted to shield wires of overhead lines, whereas tower painting for aviation warning shall be done in the following cases:

- Close to airports.
- Close to flight paths of low flying aircraft.
- Close to helicopter traffic area.

Note: warning spheres shall not be fitted on the OPGW.

4.7.10 Marking

Each fitting shall be legibly and indelibly marked with the logo of the manufacturer, the year of manufacture and the SML (if applicable).

4.7.11 Packing

Insulators shall be packed in sturdy wooden crates with outer plastic packaging suitable for both ocean and inland transportation and shall be clearly marked with the information stated below.

Hardware and fittings shall be packed in sturdy wooden cases suitable for both ocean and inland transportation and shall be clearly marked with the following information:

- Description of the items.
- Number of pieces.
- Net weight and gross weight.
- Manufacturer’s name and country of origin.
- Year of manufacture.
- Purchaser’s order number.
- Shipping destination.

4.7.12 Submittals

Submittals with Bid shall include:

- The Technical Data Schedules of this specification for each type of proposed line accessory.
- The manufacturer's quality assurance program and/or manual together with a list of international/national standard specifications covering raw materials, components, processes, tolerances, test procedures, etc. and a list of tests normally carried out on raw materials and a description of test equipment used.
- A full list of routine and sample tests carried out during and after manufacture, and a description of the test equipment used.
- A full list of all type tests performed and all relevant data confirming results.

- A list of existing transmission lines equipped with the proposed accessories and the dates of commissioning of these lines.

Submittals required following the award of the contract are four copies each of:

- Details of manufacturing, test and shipping schedules, and transportation/delivery proposals.
- Certificates covering raw materials used.
- Certificates covering routine tests carried out.
- Certificates covering type, sample and routine tests on fittings.
- A set of reproducible drawings showing for all accessories:
 - ✓ Principal dimensions and manufacturing tolerances.
 - ✓ Electrical and mechanical characteristics.
 - ✓ Fitting dimensions.
 - ✓ Material and standards.
 - ✓ Heat treatment for steel and standards.
 - ✓ Galvanizing and standards.
 - ✓ Unit weight.
 - ✓ Identification and markings.
 - ✓ Catalogue number and manufacturer's drawing number.

The Contractor need to provide for relevant support from Zambia Civil Aviation Authority in terms of appropriate aviation warnings of the transmission lines and towers.

4.8 **Grounding Materials**

4.8.1 **General**

Grounding (or earthing) shall be as shown on the tender drawings. Unless described herein, all materials shall be standard commercial quality suitable for the intended use.

4.8.2 **Standards**

The materials covered under this Specification shall conform to the following standards except as noted.

ASTM B193	Test for resistivity of electrical conductor materials
ASTM B910	Standard Specification for Annealed Copper-Clad Steel Wire
ASTM B227	Hard-drawn copper-clad steel wire
ASTM B228	Concentric-lay-stranded-copper-clad steel conductors
IEEE 80	Guide for safety in substation grounding
IEEE 81	Guide for measuring earth resistivity, ground impedance and earth surface potentials of a ground system

4.8.3 **Counterpoise cable (Earthing Conductors)**

Counterpoise and ground connecting cable (earthing conductors) for lattice steel towers, fences and metal objects grounding shall be a copper-clad steel conductor 7 No.7 AWG grade 40 HS and shall meet all the requirements of Specifications ASTM B227 or B910, and ASTM B228.

Counterpoise and ground connecting cable (earthing conductors) for lattice steel towers passing through the steel reinforced foundation shall be encased in a way that contact with any part of steel reinforcement is not possible.

4.8.4 **Connectors**

All connectors to the tower stubs/legs shall be thick tinned copper alloy cable lug with two connection holes suitable for M16 bolt.

All junctions and extensions of cables shall be a heavy-duty exothermic welding type.

4.8.5 **Packing**

The Copper-clad Steel conductor shall be placed on reels and heavy wood lagging is required. The following information shall be marked with paint on the reels and be clearly indicated:

- Type of conductor and name.
- Size of conductor.
- Exact length in meters.
- Serial number if applicable
- Net weight in kg.
- Gross weight in kg.
- Drum number.
- Manufacturer’s name and country of origin.
- Year of manufacture.
- Purchaser’s order number.
- Shipping destination.
- Rotation arrow.

Hardware shall be packed in sturdy wooden cases suitable for both ocean and inland transportation and shall be clearly marked with the following information:

- Description of the items.
- Number of pieces.
- Net weight and gross weight in kg.
- Manufacturer’s name and country of origin.
- Year of manufacture.
- Purchaser’s order number.
- Shipping destination.

4.8.6 **Submittals**

Submittals with Bid shall include:

- The Technical Data Schedules of this specification.
- Detail drawings of each piece of equipment.
- Instrument and manner used to measure footing resistance.

Submittals required following the award of the contract are four copies each of:

- Final drawings of each piece of equipment.
- Complete detail drawing showing the tower foundation grounding.

- Detailed method of measure of footing resistance.

4.9 Lattice Steel Towers

4.9.1 General

This specification covers design, shop detailing, test and fabrication of the of a family of lattice steel transmission towers, each for 400kV, 330kV and 132kV.

The 400kV and 330kV towers shall be double circuit towers with a vertical phase configuration to support two (2) ACSR conductors bundled per phase (twin bundle), one (1) ACS 7/6 AWG aluminium clad steel ground wire (330kV line), one (1) ACSR 95/55 ground wire (400kV line), and one (1) optical ground wire (OPGW).

The 132kV towers shall be double circuit towers with a vertical phase configuration to support one (1) ACSR conductor per phase, and one (1) optical ground wire (OPGW).

Throughout the line, the same towers (i.e. the identical “tower family”) will be used.

All transmission line towers dealt with in this specification are galvanized lattice steel self-supporting structures with bolted connections. The towers shall be square in plan and all towers shall generally have an independent foundation for each of the four legs.

All materials, designs, details, fabrications and tests shall comply with the requirements described hereafter and on the drawings. All designs and details shall be subject to approval by the Employer. The Employer shall have the right to require the Contractor, without additional cost, to make any changes in designs and details necessary to make the construction conform to the Contract documents.

All materials shall be brand new. Any steel member with the trace of a hole filling shall not be used. Step bolts shall conform to ASTM A307 and Structural bolts to ASTM A394.

No omission or ambiguity on the drawings or in this specification will relieve the Contractor from the responsibility of furnishing first class materials and workmanship. Should any inaccuracy be found, any further work done before these discrepancies are corrected shall be at the Contractor’s risk.

4.9.2 Standards Towers

For the 400kV, 330kV and 132kV lines, the family of towers shall consist of standard structure types as per the tower design shown below in Table 2, Table 3 and Table 4, respectively.

However, their use shall be optimized depending on actual line profile and routing.

Any alternative shall be subject to the Employer’s approval.

4.9.3 Standards and Codes

The materials covered under this Specification shall conform to the following, except as noted:

IEC 60652	Loading Test on Overhead Line Towers
IEC 60826	Loading and Strength of Overhead Transmission Lines
AISC MANUAL	Manual of Steel Construction, Volume 1, Structural Members, Specifications and Code
ANSI/ ASCE/SEI 10-15	Design of Latticed Steel Transmission Structures
ASTM A123	Zinc (Hot-dip galvanized) Coatings on Iron and Steel Products
ASTM A143	Recommended Practice for Safeguarding against embrittlement of Hot-dip Galvanized Structural Steel and Procedure for detecting embrittlement
ASTM A153	Specifications for Zinc Coated (Hot-dip) on Iron and Steel Hardware
ASTM A239	Test Method for Locating Spot in A Zinc Coating on Iron or Steel sections by the Preece Testing
ASTM A307	Carbon Steel Bolts and Studs 60000 PSI Tensile Strength
ASTM A36	Specifications for Structural Steel
ASTM A370	Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A385	Practice for providing high quality zinc coating (hot-dip)
ASTM A394	Steel Transmission Tower Bolts, Zinc-coated and Bare
ASTM A563	Carbon and Alloy Steel Nuts
ASTM A572	High-Strength Low-Alloy Columbium - Vanadium Structural Steel
ASTM A6	General requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling
ASTM A90	Test Method for Weight of Coating on Zinc-coated (galvanized) Iron on Steel sections
BS 5950-1	Structural use of Steelwork in Buildings Part 1: Code of Practice for Design – Rolled and Welded Sections

EN 1993, Eurocode 3	Design of steel structures

4.10 Type and Use of Lattice Steel Towers

4.10.1 General

This specification covers design, shop detailing, test and fabrication of lattice steel transmission towers. The towers shall be double circuit towers with a vertical phase configuration as described under section 4.9.1 General, above.

Throughout each line, the same towers (i.e. the identical “tower family”) will be used. Self-supporting galvanized lattice structures are required.

All transmission line towers dealt within this specification are galvanized lattice steel self-supporting structures with bolted connections. The towers shall be square in plan and all towers shall have an independent foundation for each of the four legs.

All materials, designs, details, fabrications and tests shall comply with the requirements described hereafter and on the drawings. All designs and details shall be subject to approval by the Employer. The Employer shall have the right to require the Contractor, without additional cost, to make any changes in designs and details necessary to make the construction conform to the Contract documents.

All materials shall be brand new. Any steel member with the trace of a hole filling shall not be used. Step bolts shall conform to ASTM A307 and Structural bolts to ASTM A394.

No omission or ambiguity on the Drawings or in this specification will relieve the Contractor from the responsibility of furnishing first class materials and workmanship. Should any inaccuracy be found, any further work done before these discrepancies are corrected shall be at the Contractor’s risk.

- For the 400kV line double circuit, the family of towers shall consist of six (6) standard structure types as per Table 2.
- For the 330kV line double circuit, the family of towers shall consist of eight (8) standard structure types as per Table 3.
- For the 132kV line double circuit, the family of towers shall consist of five (5) standard structure types as per Table 4.

However, their use depends on actual line profile and routing. Where overall line cost can be optimized with less than five (5) tower types, then some types can be omitted. In general, towers can be omitted whenever a project has less than three angle towers of any given type. When a tower is omitted, the next strongest tower in the family shall be used if the tower is compatible with the utilization.

The 0° - 10° angle tower type will be used for line deviations as well as for anti-cascading towers. Anti-cascading towers will be installed every 5 km.

Any alternative shall be subject to the Employer’s approval.

All towers, including foundations and leg extensions, shall be designed to carry, without failure, the worst combinations of loadings and the worst combinations of body and leg extensions (unequal and equal). It is expected that differential/hillside leg extensions will be required.

4.10.2 Types and Use of Towers

Towers shall normally be of the following standard types, as provided and as stated in the Technical Schedules.

Table 2 - Tower Types 400kV double circuit

Type	Position of use	Angle of deviation	Insulator string
400DA	Straight line	0° - 2°(*)	Suspension
400DB	Angle	0° - 10°	Tension
400DC	Angle	10° - 30°	Tension
400DD	Angle	30° - 60°	Tension
400DE	Angle	60° - 90°	Tension
400DET	Terminal	0° - 45° Entry & Exit	Tension

Table 3 - Tower Types 330kV double circuit

Type	Position of use	Angle of deviation	Insulator string
330DA	Straight line	0° - 2°(*)	Suspension
330DB	Angle/Section ⁽²⁾	0° - 10°	Tension
330DC	Angle	10° - 30°	Tension
330DD	Angle	30° - 60°	Tension
330DE	Angle	60° - 90°	Tension
330DET	Terminal	0° - 45° Entry & Exit	Tension
330DT	Transposition	0° - 10°	Tension

⁽²⁾ anti-cascading

Table 4 - Tower Types 132kV double circuit

Type	Position of use	Angle of deviation	Insulator string
132DA	Straight line	0° - 2°(*)	Suspension
132DB	Angle	0° - 30°	Tension

Type	Position of use	Angle of deviation	Insulator string
132DC	Angle	30° - 60°	Tension
132DD	Angle	60° - 90°	Tension
132DET	Terminal	0° - 45° Entry & Exit	Tension
132SPEC	T-section	90° + 90°	Tension

(*) 2° deviation on suspension structure shall be used to account for setting out discrepancies and minor relocation of towers only and should not be used as a design option for line deviations up to 2°.

(**) The 330kV line Route pass through a sensitive Euphorbia Area a few km north-west of Kasama Substation, in the out-skirt of Kasama Town. In the Euphorbia Area where access have to be carefully surveyed and planned to avoid all sensitive Euphorbia outcrops, see further APPENDIX 2. The Contractor shall make a detailed survey and setting out of all Euphorbia outcrops in the vicinity of the working area for the line route and access

The standard height of towers shall be based on the sag of the conductor specified in the Technical Schedules at the maximum temperature specified in the Technical Schedules and at the specified basic span length plus the specified normal ground clearance.

The standard type of tower shall be designed so that, where required, the tower heights can be extended by the use of body and leg extensions as detailed below and stated in the Schedules. Variations in height from the standard height tower are to be achieved with the minimum change to the common portion of the tower. Similarly, all body extensions shall be designed such that the tower legs are standardized and can fit on all body extensions.

Table 5 - Body & Leg Extensions for double circuit 400kV, 330kV and 132kV towers

Type	Body Extensions	Leg Extensions
DA	+3m, +6m, +9m, +12m, +15m	+1m, +2m, +3m, +4m, +5m
DB	+3m, +6m, +9m, +12m, +15m	+1m, +2m, +3m, +4m, +5m
DC	+3m, +6m, +9m, +12m	+1m, +2m, +3m, +4m, +5m
DD	+3m, +6m, +9m, +12m	+1m, +2m, +3m, +4m, +5m
DE	+3m, +6m, +9m, +12m	+1m, +2m, +3m, +4m, +5m
DET	+3m, +6m, +9m	+1m, +2m, +3m, +4m, +5m
DT	+3m, +6m	+1m, +2m, +3m, +4m, +5m

4.10.2.1 Transposition

Complete transposition is required on Kasama – Nakonde Stepdown 330kV double circuit transmission line. The contractor to propose and design type of tower or towers, vertical or horizontal. For horizontal transposition, two single circuit towers can be used. It should be noted that employer’s requirements and the price schedule assume a vertical transposition tower as the base case.

Regarding transposition locations, assuming 2 locations, the contractor to verify balanced zero-sequence impedance by power system studies (PSS/E or EMTP).

4.10.3 Tower Design

See also section 4.1 Overhead Line Design Data above.

4.10.3.1 Codes

All towers shall be designed in accordance with IEC 60826, Overhead Transmission Lines – Design Criteria. In addition, due consideration shall be given to ASCE 10-97, Design of Lattice Transmission Structures (and its successor ASCE/SEI 10-15 for the latest design requirements) and BS EN 10025 which specifies the material standards and properties.

4.10.3.2 Approval

The Contractor shall submit for the Employer’s approval the following design memorandum calculations complete with electronic files and programs:

- Design parameters.
- Sag and tension calculations.
- Load calculations.
- Loading trees.
- Foundation loads.
- Design of stubs.
- Outline drawings.
- Detail/shop drawings.
- Erection drawings and bill of materials.

4.10.3.3 Environmental Parameters

The towers shall be designed to withstand the following environmental parameters:

Wind Speed: 36m/s*

Typical Elevation: 1,600m above mean sea level

* Wind speed is given as 3-second gust under terrain category B of IEC 60826. This can be transformed to a wind speed (VRB) (10-minute mean) under the IEC 60826 wind load methodology.

4.10.3.4 Partial Factors

The partial material factors for lattice steel tower design shall be calculated in accordance with clause 7.3 of IEC 60826.

Specifically, the following strength factors (γ_M) for material strength shall be applied as a minimum:

- Steel member of suspension tower: 1.25;
- Steel member of angle tower: 1.25;
- Steel bolts of tower connection: 1.25.

4.10.3.5 Wind and Weight Spans

The span criteria used for profiling is given below. Tower designs shall therefore assume the same span criteria:

Table 6 – Tower Design span criteria

	400kV	330kV	132kV
Basic Span	400m	400m	250m
Maximum sum of adjacent spans	880m	880m	700m
Maximum single span ¹⁷	600m	600m	350m
Maximum weight span (suspension)	720m	720m	450m
Maximum weight span (tension)	900m	900m	450m
Wind/Weight ratio (suspension towers)	55%	55%	55%
Minimum weight span (tension)	-200m	-200m	-150m

4.10.3.6 Loads on towers

The following load cases, in line with IEC 60826 shall be considered:

- 100% Wind at 15°C in 15° increments around the tower (Suspension and Tension),
- Torsional Security Loads (cl. 6.6.3.1): Single broken phase/earth wire at 25°C, no wind (Suspension only),
- Torsional Security Loads (cl. 6.6.3.1): Two broken phases/earth wires at 25°C, no wind (Tension only),
- Longitudinal Security Loads (cl. 6.6.3.2): Horizontal conductor tension 50% greater in back or ahead span at 25°C, no wind,
- Construction Loads (cl. 6.5.3): Out of balance load on each crossarm (one crossarm at a time) with horizontal tension increased in one span to 200% and in the opposite span to 150%,
- Maintenance Loads (cl. 6.5.4): Conductor support points consider twice the conductor vertical load at sagging tension.
- **Applied loads, normal loading conditions**

The assumed maximum simultaneous loadings on the towers, based on the appropriate angles of deviations and span lengths and with the particulars given in the Technical Schedules shall be as follows:

a. Transverse loads

- **i) Wind normal.** The normal transverse load shall be the wind pressure stated in the schedule of guarantees characteristics acting at right angles to the line on the whole projected area of the line and earth conductors over the specified wind span stated in the schedule of guarantees characteristics and the transverse horizontal resultant of the maximum line and earth conductor tensions, stated in the schedule of guarantees characteristics, together with the wind pressure stated in the guarantees characteristics on the projected area of the insulators and on the projected area of the members of one face of the towers. Suitable allowance shall be made for the projected area of cross arms, earthwire peaks, any fibre optic transmission system equipment mounted on the tower and Aircraft Warning Markers. The full wind span shall be taken regardless of the angle of line deviation. The transverse components of line and earth conductor tensions shall be computed for the full range of specified angles of deviation.

ii) Wind at 45°. As i), but with wind acting at 45° to the line. For wind at 45° the length of conductor to be considered shall be taken as the projected length at right angles to the wind direction.

iii) Wind perpendicular to phase conductors. As i), but with wind perpendicular to conductors in one span and taken as the projected length at right angles to the wind direction on the other span. This to be considered for minimum and maximum angles of deviation.

iv) Reversed wind. As i), ii) and iii) but with wind acting in the opposite direction to the transverse and horizontal resultant of line and earth conductor tensions calculated on the minimum angle of line deviation and the conductor tension given in the Schedule of Guarantees Characteristics.

b. Vertical loads

- **i) Normal.** For normal load conditions the mass of the line and earth conductors, the mass of the insulators, insulator fittings, earth conductor fittings, spacers, dampers and ancillary apparatus where applicable. It shall be assumed that the normal vertical loads shall include the actual mass contained in the weight spans specified in the schedule of guarantees characteristics.

¹⁷ 600 m maximum span does not apply to the Euphorbia special towers, where 800 m spans are permitted per 330SPEC design and environmental constraints.

ii) Minimum. For the minimum load condition, the mass of line and earth conductors shall be considered to be zero. The mass of the insulators shall be ignored.

iii) Uplift. The uplift force acting on the towers shall be assumed to be equivalent to the mass of line and earth conductors contained in the uplift span specified in the schedule of guarantees characteristics.

c. Longitudinal loads

i) Normal. The longitudinal components of the line and earth conductor tensions stated in the Technical Schedules (checked at all angles of entry) (terminal towers only).

ii) Section. All tension towers shall be designed for the out-of-balance longitudinal components of loading. The magnitude of these loads shall be 15% of the maximum actual line conductor and earth conductor tensions stated in the schedule of guarantees characteristics.

At load attachment points of tension towers, other than those on the tower transverse center line (e.g. at pointed crossarms) the normal vertical load as defined in b. i. and the uplift load defined in b. iii. shall be applied to one face of the crossarm, with zero load on the other face and the transverse load due to wind on conductors shall be split between the front and back face of the tower in the proportion 75% to 25% respectively.

All towers shall be designed to accommodate Aircraft Warning Markers that may be located on the earth conductor in accordance with the requirements of Clause 5.15 (Aircraft) of this Employers requirements section VII. The Contractor shall give details of any reductions required to the lengths of spans where the Aircraft Warning Markers are used. Care shall be taken in the design to allow for any additional loads to which the towers may be subjected during the erection of the towers themselves and of the conductors and insulators.

4.10.3.7 Tower geometry

Tower top geometry to be determined from the above clearance requirements in still air. Still air clearances are also to be applied to phase conductors supported by suspension sets, pilot sets and jumpers inclined up to 10° towards the tower to account for low wind speeds. Power frequency clearances shall be used for phase to earth clearances at maximum conductor and insulator swing under a 1:50 year return wind.

The standard height tower to be based on the sag of the phase conductors at a maximum operating temperature of 85°C, 80°C, and 75°C for 400kV, 330kV and 132kV respectively, for the minimum ground clearance in accordance with each voltage level.

4.10.3.8 Crossing Spans

Standard tower designs may require increased height for crossing wet areas, river crossings, infrastructure (railways, roads, power lines, etc.) where applicable. Where applicable, at all crossings, the maximum span between towers shall not exceed 600 meters to ensure structural and operational compliance. The price for the design and steelwork requirements is to be included in the price schedules.

4.10.3.9 Design of Members and Connections

Unless otherwise stated in these specifications, the design of overhead transmission line towers shall conform to the latest edition of IEC 60826. Redundant members supporting a principal or secondary member shall be designed to sustain a compression load equal to 2.5% of the maximum load in the principal or secondary member.

The limiting slenderness ratio (L/r) for the family of towers shall be 120 for principal members (legs and main crossarm members) and 200 for all other members having computed stresses, 250 for Redundant members without computed stresses and 300 for Tension members only:

Redundant members shall also comply with an everyday stress EDS +2.5 % of EDS and 1.5 kN for the load of a linesman (All members with an angle less than 15° with the horizontal).

The minimum thickness of the members for towers shall be:

- Principal 6 mm
- Secondary 5 mm
- Redundant 5 mm
- Plates 6 mm or thickness of connecting member plus 2 mm

The maximum length of members shall not exceed 12 m.

4.10.3.10 Bolt Design Details

The minimum bolt spacing, rolled edge distances and sheared edge distances of sections from the centres of the bolt holes to be maintained are given in the table below.

Bolt Design Details for towers shall be:

Bolt Design Details ASCE/SEI 10-15

Member type	Units	Ø12	Ø16	Ø20
Diameter of bolts	mm	12	16	20
Hole diameter	mm	13.5	17.5	21.5
Min. bolt spacing	mm	36	48	60
Min. rolled edge distance	mm	18	24	30
Min. sheared edge distance	mm	21	28	35

The grade of bolts shall be Type 1 in accordance with ASTM A394.

Only the bolt sizes mentioned above shall be used. A maximum of two different diameters size bolts shall be used for each type of structure.

Butt splices shall be used, and thickness of inside cleat shall not be less than that of the heavier member connected. A lap splice may be used for connecting members of unequal size and the inside angle of lap splice shall be rounded at the heel to fit the fillet of the outside angle. All splices shall develop full stress in the members connected through bolts. Butt as well as lap splice shall be made as above and as close to the main panel point as possible.

4.10.3.11 Material

All rolled steel sections, flats, plates and bolt and nut bars used shall consist of steel manufactured by an approved process and shall be to the requirements of BS EN 10025 for grades S235JR and S355JO steel or equivalent from other approved standards, the provisions of which in respect of tests and analyses shall be extended to include steel less than 6 mm thick. The steel shall be free from blisters, scales, laminations or other defects. Steel sections shall preferably be ISO Standard sections chosen with a view to avoiding delays in obtaining material.

High tensile steel when stored in the fabricator's stock-yard prior to fabrication and galvanising shall be marked continuously throughout its length with a light blue water paint line. In addition, the grade of steel shall be painted on and ringed round with paint.

Joints shall be so designed as to avoid eccentricity as far as possible. The use of gusset plates for joining tower members shall be avoided as far as possible. However, where the connections are such that the eliminations of the gusset plates would result in eccentric joints, gusset plates and spacer plates may be used in conformity with modern practices. The thickness of the gusset plates, required to transmit stress, shall not be less than that of members connected plus 2 mm. The use of filler in connection shall be avoided when possible. The diagonal members in tension shall be connected entirely to the gusset plate where possible to avoid the use of fillers.

The tower members shall be accurately fabricated to bolt together easily at site without any undue strain on the bolts.

No angle member shall have the two leg flanges brought together by closing the angle.

The diameter of the hole shall be equal to the diameter of bolt plus 1.5 mm.

The structure shall be designed so that all parts shall be accessible for inspection and cleaning. Drain holes shall be provided at all points where pockets or depressions are likely to hold water.

All similar parts shall be made strictly interchangeable.

Where erection stresses combined with other permissible coexistent stresses could produce a working stress in any member appreciably above the specified working stress, such additional material shall be added to the member or such other provision made as necessary to bring the working stress within the specified limit.

4.10.4 Design Drawings, Detail Drawings and Bill of Material

4.10.4.1 Design Drawings and Calculations

The design drawings shall show the following data and information:

- Scaled line diagram of the tower including all redundant bracing members and their sizes completely dimensioned and in compliance with all clearance requirements.
- All loadings and their manners of application including the determination of wind load on tower and ladder, if any. Wind load on towers shall be applied at each panel point along the height and at the top peak of the towers.
- Loading trees for all load cases considered

Tables on the drawings shall show:

- Critical tensile and compressive loads and stresses with associated loading case for each member.
- Member designation, size, length, radius of gyration, effective slenderness ratio, number and diameter of bolts required, net tensile area, steel grade, calculated tension, compression and connection capacities, ratio of calculated capacities to critical ones for member and its connections.
- The calculated weight of the complete galvanized tower.
- Critical foundation loads with associated load cases for each leg.

4.10.4.2 Detail Drawings

Detail drawings shall be complete with sizes and detail dimensions of all tower members. This shall include all body and leg extensions, whether or not they are to be actually used for construction. At each joint, there shall be the number, size and length of bolts, number and size for fillers and detail dimensions of gusset plate, if any. The Contractor shall be required to furnish all shop drawings.

A proper cross-index shall be furnished, correlating the tower part numbers with the tower type and components and the drawing number.

4.10.4.3 Bill of Material

The Bill of Material shall give the size, length and galvanized weight of each member and the total weights of body, body extension, leg extension and stub. It shall also include the number of bolts, nuts and washers per structure.

4.10.5 Fabrication

Fabrication of material shall be in accordance with the latest revision of “Specification for the Design, Fabrication and Erection of Structural Steel for Buildings” published by the American Institute of Steel Construction (AISC) or any other approved standard. Fabrication shall not commence until approval of drawings.

4.10.5.1 Workmanship

Workmanship shall be first class throughout. All pieces must be straight, true to detail drawings and free from lamination flaws and other defects. All clipping, back-cuts, grindings, bends, holes, etc. must be true to detail drawings and free of burrs.

All identical pieces bearing the same erection number must be exactly interchangeable with each other and interchangeable in their relative position in all towers or structures of which they form a part.

Threads of bolts and nuts shall be cleanly rolled or cut, and the face and head of nut shall be truly at right angle to the axis of the bolt.

4.10.6 Bolts

Bolts shall be full-sized in the shanks. The shanks shall be round and free of projected fins. The heads’ bolts shall be hexagonal, full proportions on all sides, properly centred on the shank, and have a bearing surface which is perpendicular to the axis of the bolt, of full area, free of burrs and reasonably smooth.

4.10.7 Nuts

Nuts shall be hexagonal and of dimensions adequate to develop full strength of the bolts. The bearing face of each nut shall be perpendicular to the axis of the threads, free of burrs and projections, and shall have chamfered corners.

4.10.7.1 Anti-Theft Fasteners

Appropriate anti-theft fasteners for example Huck-bolting shall be applied on all the towers up to the level of 2m above the anti-climbing devices, to prevent theft of tower members.

4.10.7.2 Shearing and Cutting

Materials may be sheared to length, but the ends, unless otherwise noted, must be square with the flanges and faces and free of burrs so that difficulty of assembly caused by interference with other members at the time of assembling the steel tower shall not occur.

The use of a burning torch is permissible for cutting members providing that all irregular edges are trimmed smooth before galvanizing. Stresses shall not be transmitted into the metal through a burned surface. The material adjacent to a burned surface for a distance equal to the thickness of the materials shall not be considered a part of the net section for tension members. The use of a burning torch for cutting bolt holes will not be allowed.

4.10.7.3 Punching and Drilling

Holes are to be punched with racks and jigs employed to ensure accuracy throughout. The punches and dies for this work must be maintained sufficiently sharp so as to produce clean round holes normal to the plane of material, free of burrs, folds, depressed or upset edges.

Special care is to be exercised to ensure exact spacing of holes and their distance from back of angle and to end of piece. Any member having holes or cuts more than 0.8 mm from correct position will be subject to rejection. No welding, filling or plugging will be permitted unless approved by the Employer.

Holes may be punched up to a thickness equal to the hole diameter minus 1.6 mm, for structural steel and the hole diameter minus 4.7 mm for high-strength structural steel except that, in mild steel over 19 mm thick and in high-strength structural steel over 16 mm thick, holes must be drilled, or sub punched and reamed.

Holes in bent members which may be affected by the bending operation shall be laid out and punched or drilled after bending. Holes which are elongated or otherwise distorted by bending will not be accepted.

The diameter of bolt holes shall not exceed the bolt diameter plus 1.5 mm.

4.10.7.4 Bending

All bending of structural steel shall be done in accordance with AISC or other approved standard. Methods for bending utilizing heat shall be approved by the Employer.

4.10.7.5 Welding

All welding shall be performed in accordance with “The Structural Welding Code”, AWS D1.1, of the American Welding Society, or other approved standard. A shielded arc-welding process shall be used. All welds shall be made in such a manner as to minimize residual shrinkage stresses. When extremely thick plates are welded (such as base plates), preheating may be necessary to avoid formation of shrinkage cracks. If not previously qualified, the welding process and the welding operators employed in performing the works covered by the Contract documents shall be qualified in accordance with the American Welding Society Standard Qualification Procedure. No field welding will be allowed.

4.10.7.6 Marking

All individual pieces shall be marked with the correct designations shown on the approved detail drawings. Markings shall be done by stamping the marks into the metal before galvanizing, and details shall be clearly legible after galvanizing. The number and letter shall be a minimum of 12 mm in height.

4.10.7.7 Cleaning and Galvanizing*a) Cleaning*

After fabrication has been completed and accepted, all materials shall be clean of rust, loose scale, dirt, oil, grease and other foreign substances.

b) Galvanizing

Unless otherwise indicated on the Drawings, all materials shall be hot-dip galvanized after fabrication and cleaning.

Galvanizing for structural steel products shall meet requirements of ASTM A123. The minimum average coating thickness of all specimens tested shall conform to the requirements of Table 1 of ASTM A123 for the categories and thicknesses of material being galvanized, as follows:

The minimum average coating as per Table 1 of ASTM A123

TABLE 1 Minimum Average Coating Thickness Grade by Material Category

Material Category	All Specimens Tested Steel Thickness Range (Measured), in. (mm)				
	<1/16 (<1.6)	1/16 to <1/8 (1.6 to <3.2)	1/8 to 3/16 (3.2 to 4.8)	>3/16 to <1/4 (>4.8 to <6.4)	≥1/4 (≥6.4)
Structural Shapes and Plate	45	65	75	85	100
Strip and Bar	45	65	75	85	100
Pipe and Tubing	45	45	75	75	75
Wire	35	50	60	65	80
Reinforcing Bar	...	...	...	...	100

The minimum average thickness of coating for any individual specimen is one coating grade less than that that required in Table 1 of ASTM A123, but not less than 85 µm.

The weight of zinc coating (g/m2) for the corresponding coating thickness can be determined from Table 2 of ASTM A123, as follows:

The minimum thickness of coating grade as per Table 2 of ASTM A123

TABLE 2 Coating Thickness Grade^A

Coating Grade	mils	oz/ft ²	µm	g/m ²
35	1.4	0.8	35	245
45	1.8	1.0	45	320
50	2.0	1.2	50	355
55	2.2	1.3	55	390
60	2.4	1.4	60	425
65	2.6	1.5	65	460
75	3.0	1.7	75	530
80	3.1	1.9	80	565
85	3.3	2.0	85	600
100	3.9	2.3	100	705

^A The values in micrometres (µm) are based on the Coating Grade. The other values are based on conversions using the following formulas: mils = µm × 0.03937; oz/ft² = µm × 0.02316; g/m² = µm × 7.067.

In addition, welded assemblies which may be particularly susceptible to cracking and/or distortion shall be galvanized and tested in accordance with ASTM A143. All holes in material shall be free of excess spelter after galvanizing.

- Galvanizing for bolt, step bolts, hinges, shackles, nuts, lock nuts, fillers, washers, spring washers and similar hardware shall meet the requirements of ASTM A153 as follows:

Galvanizing as per ASTM A153

Class of Material	Units	Minimum Weight of Zinc Coating of Surface	
		Average Specimens Tested	of Any Specimen Individual
Class C Bolt (over 9.52 mm in diameter) and similar articles. Washers 4.76 to 6.35 mm thick	g/m ²	381	305
Class D Washers under 4.76 mm thick	g/m ²	305	259

- Galvanized steel members shall be dipped into solution of dichromate after galvanizing for prevention of white rust during transportation and storage.

c) Uniformity of Coating

The uniformity of coating test shall be made in accordance with ASTM A239. The minimum repetition times for one-minute dip in uniformity test shall be as follows:

- Steel shapes and plates 6
- Bolts, nuts and similar hardware 4

d) Minor Repair

Materials on which galvanizing has been damaged shall be re-dipped unless, in the opinion of the Employer, the damage is local and can be repaired by applying a coating of galvanizing repair paint or spraying.

Where such repair is authorized, the damaged area shall be cleaned by wiping with clean rags saturated with mineral spirits of Xylene, followed by wire brushing. After wire brushing, the area shall be re-cleaned with solvent to remove residue and shall be given one brush coat of galvanizing repair paint. The % age of pure zinc by weight in dry film of galvanizing repair paint shall not be less than 85. Thickness shall be in accordance with manufacturers recommendation and as approved by the Employer.

4.10.7.8 Shop Assembly

One tower of each type and height, including every combination of leg extensions, shall be assembled in the shop to such an extent as to ensure proper field erection.

If any errors on the drawings or fabrication are discovered, all incorrect drawings shall be revised and the corrected part re-fabricated and reassembled. All revised drawings shall be resubmitted to the Employer for approval. This is a hold point.

4.10.7.9 Quality Assurance Testing

The Contractor shall have furnished with the Bid a detailed Quality Assurance Procedure and shall be responsible for performing all tests and inspections required during the production of the towers.

The Contractor shall identify all materials, including bolts and nuts, used on the project on the appropriate mill test reports and/or material certifications, and shall furnish the mill test report and/or certifications to the Employer.

The Contractor shall make dimensional checks of all materials for conformity to ASTM A6 or any relevant approved standard.

The Contractor shall make a visual inspection of all materials before and after galvanizing. Embrittlement tests shall be made in accordance with ASTM A143 or any relevant approved standard. Uniformity of coating tests shall be made in accordance with ASTM A239 or any relevant approved standard.

Thickness of coating tests shall be made in accordance with ASTM A90 or any relevant approved standard. Size of test “lot” and number of tests shall be in accordance with the appropriate ASTM Standards or any relevant approved standard.

4.10.7.10 Painting of High Tower

Painting of high towers shall be in accordance with Zambia Civil Aviation Authority (ZCAA) requirements.

4.10.7.11 High Tower Warning Light

Warning lights on extra high towers shall be in accordance with Zambia Civil Aviation Authority (ZCAA) requirements.

4.10.8 Tower Accessories

4.10.8.1 General

Each tower shall be provided with the necessary pull-off plates, tower attachment hinges, strain links, etc., at all conductor and shield wire attachment points. Towers shall be provided with all the steel work necessary for signs. Painting of high towers, and warning lights will be in accordance to Zambia Civil Aviation Authority requirements. The Contractor shall consult the Zambia Civil Aviation Authority in these matters.

4.10.8.2 Ladder Bolts

Each tower shall be provided with ladder bolts of an approved type on **two diagonally opposite legs** of tower body and on each side of delta structure and spaced on alternative flanges at 375 mm starting at ACD level and continuing up to 1.0 m below the shield wire attachment point.

Between ground level and the ACD level, removable ladder bolt holes shall be provided.

Each ladder bolt shall be capable of withstanding a vertical load of 1500 N.

4.10.8.3 Signs

Conspicuous tower number plates shall be provided and fixed on each tower in positions approved by the Employer.

Tower number plates shall be of two (2) types, one suitable for use on the lower tower for observation and identification from the ground and one of large size tower top type suitable to facilitate aerial/airborne observation and identification.

Each tower shall be furnished with a Danger and Number plate for use on the lower tower. Two (2) large Aerial Number plates shall be provided on every 10th tower to enable tower identification from either transverse side of a tower. Three (3) Phase plates shall be provided on every tower of red, yellow and blue to identify each phase on the source transverse side of a tower.

The size and characteristics shall conform to the details illustrated on attached drawing.

All signs shall be completed with mounting accessories such as bolts, lock washers, etc.

All plates shall be of adequate thickness to ensure no bending of plates and be made of anti-corrosive material, if enamelled iron plates are used, the whole surface of each plate including its front, back and edges shall be properly covered and resistant to corrosion.

All plate colours shall be permanent and free from fading and enamelled or other finished shall have washers of material that will not damage plate surfaces or permit introduction of corrosion and be provided for the back and front of securing bolts can take place and no cracking of surface colouring can occur.

Damaged, chipped or cracked plates and surface colouring will not be accepted.

4.10.8.4 Bird Guards

Tower members positioned above suspension insulator strings and solar panels (if applicable) shall be fitted with stainless steel needle strips, effectively preventing birds from sitting in these locations. The strips shall extend sufficiently, horizontally beyond the protected location and be applied to all surfaces a bird can sit on. Where needles are projecting from the crossarm contour towards live parts, the tower clearance diagram shall consider the height of the needles. Devices shall be easily removed and replaced for maintenance purposes.

4.10.8.5 Anti-Climbing Devices

The towers shall be provided with an approved anti-climbing device at a height of 3 to 5 meters from ground level.

The anti-climbing device shall be provided with a hinged gate at each corner of the tower where steps are foreseen for easy line maintenance. These hinged sections shall be provided with a closing fitting suitable for accommodating a padlock but shall be provided with and installed with by a nut and bolt in lieu of a lock.

4.10.8.6 Tower Shield Wire Grounding

Suitable holes shall be provided in a position immediately adjacent to the shield wire attachment point suitable for connection of the metallic bond from the shield wire.

Similarly, to the above shall be provided for the tower earthing requirements according to the details shown on the Drawings.

The Contractor shall furnish all the ground plates, rods, ground wire clips and other material required in the amount specified in the Bill of Quantities.

4.10.9 Packing

Packing methods and the detail of packing lists are the responsibility of the Contractor and shall be submitted for acceptance by the Employer who reserves the right to inspect the supplies and their packing before shipment.

The packing requirements shall insure that the supplies will be able to withstand, without damage or deterioration, ground and sea transportation and all handling operations, loading and unloading, until they have reached their destination.

All galvanized supplies shall be adequately protected against the risk of corrosion such as “white rust”, which might be caused by water, saline air or prolonged humidity.

4.10.10 Testing

This Clause of the specification covers testing of tower prototypes.

4.10.10.1 Tower Testing

A galvanized tower of each type, with extensions shall be fabricated and transported to the test site for Tower loading Tests as per IEC 60652.

The prototype should be fabricated according to the drawings. Physical properties of material shall be as close as possible to those specified in the referred standards.

Tower testing includes, for each tested tower, assembly and erection of the tower on the test pad, installation of the rigging, complete testing under specified loading cases, dismantling the tower and preparation of the test report.

The procedure for conducting the tower test shall be as specified in the latest edition of IEC 60652.

The Contractor shall provide the test loading cases applicable per tower, which includes the loading case for the destruction test. The selected test loading cases will be subject to approval by the Employer.

The Contractor shall submit to the Employer, for approval, his detailed program and proposal for testing the towers showing the methods of carrying out the tests and manner of applying the loads. After the Employer has approved the test procedures and programs, the Contractor shall advise the Employer about carrying out the tests at least 30 days in advance of the scheduled date of tests.

Test loads will be applied at conductor and shield wire attachment points using a method which simulates the loading conditions on the design Drawings. The wind load on the tower will be applied to at least three representative panel points between the cross-arm and the ground. All instruments used for testing, if required by the Engineer, shall be calibrated by an independent authority.

The towers to be tested shall correspond to tower types as stated in Schedule of prices.

The prototype of towers shall be tested in accordance with the following procedures:

- a) Erect the tower to a vertical tolerance of 0.2 % on rigid foundations and ensure that the actual stub detail is accommodated.
- b) Ensure the fittings at the insulator and shield wire attachment points are, or represent, the actual fittings to be used on the line.
- c) Apply maximum and complete ultimate design loads for each load combination, including load combinations resulting from stringing and erection operations which must be tabled in the loading program.
- d) The sequence of load combinations and the percentage of maximum load at the intermediate holding periods will be subject to the Employer's approval.
- e) Hold all maximum ultimate loads at 100 percent loading test, allow sufficient time for a full examination of the structure to check for any permanent distortion or failure.
- f) Immediately following the 100 percent loading test, allow sufficient time for a full examination of the structure to check for any permanent distortion or failure.

Should any permanent distortion or failure be evident during the 1 minute load-applicable period, or the subsequent examination, remedial measures shall be carried out to the Employer's approval, and the tower retested.

All tests shall be carried out to destruction. Any tower destroyed by the test shall not be paid for by the Employer and shall not be used for line construction except otherwise instructed by the Employer.

Record deflection readings in both the transverse and longitudinal directions.

Following the successful testing of each structure, the Employer will select a maximum of eight (8) members from the tested tower for tensile tests to determine yield and ultimate tensile value. Ensure these members are suitably and indelibly marked prior to the dismantling of the tower. Should this test show that the steel does not conform to that specified, the engineer/Employer reserves the right to call for re-testing of the tower.

During the dismantling of the tower if a destruction test has not been carried out, any evidence of excessive elongation of bolt holes or deformation of bolts will be regarded as failure.

4.10.10.2 Shop Assembly

In case of premature failure, the tower shall be retested. All damaged members shall be replaced by new members. The Employer may ask to replace the complete tower if extensive damage occurred during such failure. The Contractor shall provide facilities to the Employer or their representatives for inspection of materials during manufacturing stage and also during testing of the same.

4.10.10.3 Acceptance

If any of the members show evidence of permanent deformation, the Employer shall request the Contractor to make necessary alterations and proper replacements of deformed members at the Contractor's expense.

Large permanent residual deformation in the tower after unloading may be considered as a failure.

During the tests, all the deformations and displacements of the tower shall be precisely measured and recorded in the final report.

All instruments intended to measure the loads shall be calibrated before the beginning of the test.

Six (6) copies of the test reports shall be supplied to the Employer.

4.10.11 Verification of the Material's Resistance

Mill test reports of the materials used for the fabrication of the prototype shall be available for Employer's inspection. After the conclusion of testing, mechanical tests shall be performed on up to five (5) selected members. The Employer shall decide the members, which are to be tested.

The results of the mechanical tests shall be presented in the final report.

4.10.12 Disposal of the Prototype

No part of any tower subject to tests shall be allowed to be used in the work except with written approval of the Employer.

4.10.13 Final Tower Production

The Contractor shall ensure that the specification of materials and workmanship of all towers actually supplied conform strictly to the towers which have successfully undergone the tests. In case any deviation is detected, the Contractor shall replace such defective towers free of cost to the Employer. All expenditure incurred in erection, to and for transportation, any other expenditure or losses incurred by the Employer on this account shall be fully borne by the Contractor. No extension in delivery time shall be allowed on this account. The Employer, however, reserves the right to waive off the testing of the towers, provided the Contractor had earlier successfully tested, erected and commissioned similar towers and certificates for such tests carried out earlier are furnished duly certified by that Employer and are found acceptable.

4.10.14 Submittals

Submittals required with tender include:

- The Technical Data Schedules of this specification for each type of proposed towers.
- The manufacturer's quality assurance programme and/or manual together with a list of international/national standard specifications covering raw materials, components, processes, tolerances, test procedures, etc. and a list of tests normally carried out on raw materials and a description of test equipment used.
- Outline drawings of proposed towers showing loading, dimensions, ground line and foundation loads.
- Drawings showing electrical clearances for all critical conditions.
- List of existing transmission lines with the dates of commissioning of which the tower designer and manufacturer have supplied towers.

Submittals required following the award of the contract are four copies each of:

- Detailed calculations for the tower design loads and diagrams showing all tower design loading conditions.
 - PLS Tower back-up file or similar.
 - Drawing of tower footings and stubs to be buried into the concrete or grillage foundations.
 - Drawings of attachments of insulator strings and shield wire for all types of towers and drawings showing vertical and horizontal distances between points of attachment of insulator strings and the position of these points relative to the points of attachment of the shield wire.
 - Details of manufacturing schedules and transportation/delivery proposals.
 - Final design drawings, erection drawings and anchor drawings.
 - Drawings of configuration and fixation of all accessories including danger, number, phase and aerial number plates.
 - Test certificates for steel quality and galvanising.
 - Test certificates for bolt and nut quality and galvanising.
 - Schedule of tower test loads.
 - Detailed tower testing programme, including a schedule of all the loads to be applied in each of the test cases set out in the schedule of test loads.
 - Full reports on the tower type tests.
-

4.11 Tower Foundations

4.11.1 General

All standard and special foundations shall be designed to resist the reactions resulting from any height of tower and its extensions. The stresses in the various parts of all foundation structures shall not exceed the figure stated in the Technical Parameters.

The connection between tower and foundation shall, for self-supporting towers, be by means of stub angles with bolted-on cleats designed to transfer the leg loads, as required in the Technical Parameters, into the main concrete block comprising the foundation. The stub for each tower type shall be standard for all heights of tower and, where practical, foundation class. The stub shall be fully encased inside the pad or extend to the bottom of the foundation.

The stub is considered as part of the foundation. Therefore, the safety factor of the foundation shall apply to the stub and cleats calculation.

The type of foundation to be used at each tower position shall be to approval and shall normally be decided on the most economical solution. Special foundations and their extensions shall be provided where required and shall be of approved designs.

4.11.2 Design Data

The foundations shall be designed to resist thrust, uplift, overturning and vertical and horizontal forces. Foundations shall also be able to withstand the stresses which may be imposed upon them under erection and stringing operations.

The design of foundations shall take the following parameters into account:

- All loads transferred from towers with the same load combinations as for towers.
- Weight of towers.
- Relevant soil parameters.
- Partial safety factors:

Concrete foundations shall be designed according to the latest edition of the following standards:

BS EN 1992-1	Design of Concrete Structures
BS EN 206-1 and BS 8500	Concrete Specification, performance, production and conformity
IEEE 691	Guide for transmission structure foundation design and testing

Permissible stresses prescribed in the code shall not be exceeded under loading conditions. The minimum concrete cover for reinforcing bars shall be 50 mm. The cover shall be increased to 75 mm for concrete placed directly against ground, rock and surfaces subjected to corrosion caused by sulphates or corrosive chemicals.

Design foundation factors for

- (i) Concrete
- (ii) Reinforcing steel ;
- (iii) Conductors and earthwire

Under maximum load condition ;

- (iv) Soil property at suspension towers
- (v) Soil property at angle towers

The density of concrete shall be assumed to be 2240 kg/m³ in dry soil and 1200 kg/m³ in soil below the water table.

The Contractor shall include with the Bid the following:

- The preliminary design drawings of the proposed foundation designs.
- The detail and complete calculations of one typical foundation design per type of soil.
- All considered criteria, data and others, used for the design of foundations.
- All relevant documentation.
- Location of the laboratory where aggregates and concrete cubes or cylinders will be tested.

4.11.3 Foundation Soil Classification

Foundation Class	1	2	3	4	4W	5	5W	6
Foundation types	Rock anchor	Concrete pad and chimney	Concrete pad and chimney	Concrete pad and chimney	Concrete pad and chimney	Concrete pad and chimney	Concrete pad and chimney	Special: Piling, raft, enlarged concrete pad and chimney
Approximate soil description	Homogeneous rock	Fractured rock/hard clay/ very dense sand	Stiff clay/ dense sand	Firm clay/ medium dense sand	Firm clay/ medium dense sand	Soft clay/ loose sand	Soft clay/ loose sand	Complex or expansive clay soils, peat, bog, swamp or marshland areas
Estimated soil type in Zambia	Dolomite Shist Limestone	Sandstone	Fine to coarse sandy gravels	Kaolinite Clays and sandy gravels	Kaolinite Clays and sandy gravels	Sediment Sandy Loam	Sediment Sandy Loam	As above
Nett allowable design bearing capacity under ultimate load (kN/m ²)	>750	>400	>250	>150	>100	>50	>50	<50
Design uplift frustum angle	30° ⁽⁵⁾	25°	20°	15°	10°	10°	0°	N/A
⁽¹⁾ Approximate sub-soil investigation parameters: #SPT Cohesive soil, N (blows/300mm) Frictional soil, N (blows/300mm)	- -	>30 >40	>19 >25	>12 >17	>8 >12	>4 >7	>4 >7	<4 <7
Undrained shear strength, Cu. (clay soils only) kPa	-	>150	100-150	40-75	40-75	20-40	20-40	<20
Internal angle of friction, ϕ (cohesive soil)	-	37°	33°	30.5°	29.5°	28°	25°	-
Internal angle of friction, ϕ (granular soil)	-	38.5°	35°	32.5°	30.5°	29°	26°	-
⁽²⁾ Allowable lateral earth pressure # to (kN/m ²) Backfilled/disturbed soil: Undisturbed soil:	Nil 400	Nil 50 + 50H	Nil 50 + 25H	Nil Nil	Nil Nil	Nil Nil	Nil Nil	Nil Nil
Water table level	>0.5 m below Fdn level	>0.5 m below Fdn level	>0.5 m below Fdn level	>0.5 m below Fdn level	Grd level to <0.5 m below Fdn level	>0.5 m below Fdn level	Grd level to <0.5 m below Fdn level	Variable
Concrete density kg/m ³	2240	2240	2240	2240	2240/1200*	2240	2240/1200*	2240/1200*
Undisturbed Soil density kg/m ³	>2000	>1800	>1600	>1500	>1500/1000*	>1400	>1400/960*	<1400/960*
Backfill Soil Density kg/m ³	>1600	>1600	>1500	>1400	>1400/960*	>1400	>1400/960*	>1400/960*

* Submerged density is subject to verification by foundation test

Notes:

- Sub-soil investigation limits based upon results of Standard Penetration Test or Dynamic Cone penetrometer tests use correlations between N (blows/300mm) or cone resistance Q_c (kg/cm²) and allowable bearing capacity generally accepted for most soils.
- Lateral earth pressure to be considered ignoring first 1.0 m below ground level.
- H = depth below ground level.
- For augered shaft foundations the maximum ultimate friction/adhesion stress assumed between concrete and soil, averaged over the depth of the foundation, shall be 60 kN/m².
- Mobilisation of full frustum angle is dependent upon provision of undercut to concrete pad.
- Changes in foundation classifications must be subjected to approval by the employer.

4.11.4 Specified Types of Foundations

The required basic type of foundations depends on the soil type defined in the table below:

Table 7 - Specified Types of Foundations

Type of Soil	Type of Foundations
1	Reinforced concrete foundations with adequate rock anchors.
2 - 5	Reinforced concrete pad and chimney or auger footing with enlarged base (elephant foot)
6	Special foundation (raft or pile)

The foundations shall be designed to resist thrust, uplift, overturning and vertical and horizontal forces. Foundations shall also be able to withstand the stresses which may be imposed upon them under erection and stringing operations. Concrete foundations shall be designed according to the latest edition of the following standards:

BS EN 1992	Design of Concrete Structures
BS EN 1997	Geotechnical Design
BS EN 206-1 and BS 8500	Concrete Specification, performance, production and conformity
IEEE 691	Guide for transmission structure foundation design and testing

All foundations must have a chimney height above ground of minimum 500mm (500mm should be taken above site maximum flood level).

4.11.5 Rock Anchors

For Soil type 1, rock anchors shall be used where good quality rock is encountered at or near the ground surface.

Rock anchors shall consist of deformed bars, not less than 25 mm in diameter, securely grouted in the rock. The required number, depth and spacing of the bars shall depend on the quality of the rock. Anchors may be either passive or stressed. special care must be taken to ensure protection of the tendons against corrosion. The anchor array shall be terminated in a reinforced concrete cap set a minimum depth of 300 mm into the rock. The cap shall provide the resistance to compression and shear loads, with the anchors being used to resist uplift. A concrete chimney shall be provided around the stub from the top of the cap to the required height above ground level. The anchorage hole shall be minimum 100mm diameter to ensure required reinforcement cover can be achieved and maintained. The Contractor shall provide all necessary rock parameters (RQD and UCS) to prove the rock strata encountered.

Where the Contractor wishes to use rock or ground anchor array foundations, Contractor shall provide evidence of his previous successful use of anchors in rock and in ground (if such anchors are proposed) for overhead line foundations and of their satisfactory service life. Contractor shall provide a Method Statement defining procedures to be used for design and installation of the anchors, including specific details about quality controls and the actual equipment which will be used for drilling and grouting. The Contractor will be expected to carry out sufficient testing of his proposals, in the presence of the Engineer, to confirm that his methods for design and installation will produce anchor foundations that are fit for purpose, prior to approval by the Engineer of the system.

Design and/or proof testing to IEC 61773 or ASTM D4435 or shall be carried out for all anchor foundations. a suitable proposal and work programme shall be submitted by the Contractor for the Engineer’s approval together with the initial submission to use anchor foundations. At least five (5) different tests shall be performed for each type of rock and for each anchor rod design length and type. Test sites shall be selected to be representative of those to be encountered during foundation excavation and be approved by the Employer. The Contractor shall provide all labour, material and equipment necessary to perform the tests.

The Contractor can offer an alternative design to the anchor type foundation using uplift frustum theory subject to the approval of the engineer.

4.11.6 Pad and Chimney or Auger Footing

For Soil types 2, 3, 4, 4W, 5 and 5W reinforced concrete pad and chimney or auger footings will normally be required. Where necessary, the concrete shall be reinforced. All steelwork below ground level (except concrete reinforcement) shall be completely galvanized and firmly keyed and grouted and designed to withstand the load due to the specified conditions in accordance with the particulars given in the Technical Parameters. The stubs shall be directly buried in concrete and loads in the stubs shall be transferred to the main concrete block by means of bolted-on cleats, which shall comply with the requirements of the Technical Parameters.

In no case shall the allowable bearing capacity of the ground be exceeded, and any eccentricities created by biaxial loading shall fall within the middle third of the base on both axes. In no case shall the area of the base in uplift due to the effect of the eccentricities be greater than 25 % of the total area of the base.

It should be noted that all concrete block foundations which are founded in rock strata shall be constructed such that the bottom pad of the foundation shall be cast directly against either a vertical wall of rock for a minimum height of 500 mm or against an undercut into the rock of at last 15° to the vertical and extending for a height of at least 250 mm. Formed concrete pyramid foundations shall not be used in rock.

Where suitable ground conditions occur, the Contractor may propose for the approval of the Engineer the use of foundations consisting of a single augered shaft per leg. Holes for the foundation shall be vertical and bored to a minimum diameter of 1 metre with an undercut at the base of not less than 1.5m diameter. A construction depth for each footing shall be first determined from a penetrometer test at the site and confirmed by a knowledge of the soil strata. Great care shall be exercised on selecting areas suitable for augered foundations which shall be founded in dense dry sands suitable for containing an undercut or in sandstone strata. Soft to firm clays and fine-grained soils generally shall not be considered for single auger bore foundations. The bottom of each excavation shall, after removal of loose spoil, be penetrated by driving an iron bar to ensure continuity of the foundation bearing strata.

Construction of reinforced concrete footings shall be carefully supervised at all times and holes shall be dry with no sign of collapse of the walls. Tower stubs, shortened, if necessary, shall be held by template and encased in concrete from 0.3m – 1.05m above the ground line. The concrete shall be fully reinforced with deformed steel rebar so as to ensure no tensile loading of the concrete itself. Sufficient anti-bursting steel shall be installed adjacent to

stub and cleats as required. Any requirement elsewhere in the Specification for stub to leg joints to be embedded in concrete below the ground line shall not apply to auger foundations. If necessary, bentonite or slurry shall be used to prevent the collapse of walls or permanent casings shall be provided subject to approval from the Engineer.

The capacity of an augered footing when subject to bearing or uplift combined with horizontal loading shall be demonstrated in accordance with the specified test procedures. Tower stub and reinforced concrete cap design and construction shall be tested separately.

Augered Foundation dimensions shall be estimated for tender purposes on the basis of a depth of 6 m plus the undercut.

Type testing of foundations shall be carried out in accordance with IEC 61773. The total number of each type of test is included in the Schedule of Prices.

The location for each test and choice of foundation to be subjected to test shall be to the Engineer's approval. Method Statements, Testing Proposals, and Calibration Certificates shall be submitted in advance to the Engineer for approval and shall include details of the following:

- Relevant ground investigation data
- Foundation type and installation procedure
- Proposed type and set-up of testing equipment
- Unique reference numbers of calibrated instruments and equipment
- Foundation testing procedure and test record sheets to be completed on site (record sheets should clearly include proposed loading/unloading targets and minimum monitoring periods)
- Proposed testing schedule and programme for contract

Additional foundation testing may be requested by the Engineer at his discretion.

4.11.6.1 Type tests (Design)

Type tests, or design tests, shall consist of site trials of sacrificial foundations installed to the same methodology as that intended for the working foundations. Design tests shall involve uplift test to ultimate design loadings or to destruction and shall be carried out on class of standard foundation as stated in Schedule of Prices. Tests will be such to verify that the selected design parameters for foundations are suitable for the relevant range of ground conditions.

Each foundation shall be subjected to test loads in order to prove compliance with the ultimate loading conditions. Test loads may be specified by the Engineer. The maximum displacements for settlement and uplift shall be consistent with the type of structure to be supported and comply with the maximum allowable differential movement under simultaneous ultimate loadings.

The type testing schedule of any foundation design shall be completed in advance of any permanent works utilising that design and shall be used in the verification process of the Contractor’s design. For this purpose, he will be responsible for carrying out type testing or design testing in the most common ground conditions at an early stage of the Contract.

4.11.7 Special Foundations

For Soil type 6, concrete raft foundation or special (piled) foundation is recommended. In addition to the standard foundations, where the investigation of subsoils according to the Specification has indicated ground of very low bearing capacity and/or high-water table in granular soils or other special circumstances, special foundations are to be provided. A special foundation will normally be one that has been specifically designed for a site and shall be tailored to fit the geotechnical conditions for the site. These foundations shall be designed in accordance with established principles of soil mechanics and shall be of one of the following types – either concrete pad and chimney with enlarged pad, concrete raft or deep reinforced concrete piles (bored or driven) with reinforced concrete cap.

In addition, special foundations may include the use of ground anchor array foundations, which in certain circumstances could be designed to cover a specific and agreed range of ground conditions, as well as extended pad or pyramid and chimney foundations, which may be used for a pre-defined range of ground conditions.

- i. Extended pad foundations can be used to extend the range of soil parameters for which the original standard foundation was designed. The extended reinforced concrete pad shall be cast under and tied into the standard foundation. This foundation type is used frequently for ground conditions where water is encountered in reasonably compact frictional soils.
- ii. Raft foundations are infrequently used, they are an expensive alternative, but they are sometimes employed in areas which have been subject to mineral working, and which perhaps have been backfilled. The large pad, encircling all four legs, shall be designed to maintain the relative position of the legs.
- iii. Pile foundations shall comprise multiple reinforced concrete piles bored or driven to a depth determined by the Site soil investigation.
- iv. Bearing for pile foundations shall be composed of pile end bearing or shear resistance of the soils developed over the effective surface area of the piles depending on whether the pile is end-bearing or designed in friction. The under-surface of the pile cap shall be considered as not contributing to the bearing surface of the foundation.

Ground anchor array foundations may also be offered as an alternative in compact dry frictional ground conditions. The general design requirements shall be as for the rock anchor array foundations, but design parameters shall be proposed by the Contractor based on his investigations and experiments.

4.11.8 Tower Leg Connection and Anchorage

The connection of the tower to foundations shall be by means of a steel stub angle. The stub angle shall have at least the same size as the leg member to which it connects and shall be hot-dip galvanized for the full length.

Stub angle shall be provided with holes for earthing and connections to tower body, in accordance with tower detail drawings.

The anchorage of the steel stub angle in concrete foundations shall be provided by bolted cleats.

All stub angles shall have at least two cleats at the lower end. The minimum embedded length of the stub angle shall be the length required to resist pull.

The spacing between cleats shall be two times the flange width of the cleat. Minimum distance from upper cleat to the top of concrete shall be eight times the flange width of the cleat angle.

4.11.9 Materials

4.11.9.1 Concrete

Concrete shall be of grade C30/37 (a minimum 28 day cube strength of 37 N/mm²). Sulphate Resistant cement shall be used for areas where the nature of the soil is very aggressive as directed by the Employer.

4.11.9.2 Steel Reinforcement

Steel reinforcement shall consist of deformed bars conforming to the requirements of EN 10080 with minimum yield strength of 420 N/mm².

Placing of Steel reinforcement shall conform to the BS EN 1992 unless otherwise specified.

4.11.9.3 Steel Members

Steel members shall be the same grade as the tower steel but with a minimum thickness of 6 mm.

All steel members shall be galvanized.

4.11.10 Detailed Calculations, Shop and Construction Drawings

4.11.10.1 Detailed Calculations

Detailed calculations for each type of foundation shall be submitted for approval such calculations shall include the following:

- Detailed calculations of forces acting on foundation for each loading condition.
- Actual safety factors for each type of stability and condition.
- Maximum stresses in concrete and in steel reinforcement at all critical sections.
- Detailed calculations for anchorage and reinforcing bar areas, spacing, embedment lengths, splices, etc.

4.11.10.2 Shop and Construction Drawings

Details of each type of foundation shall be submitted for Employer's approval and shall conform to the requirements described hereafter. Once approved, no change shall be made without the written approval of the Employer. The shop and construction drawings shall at least include:

- Detailed dimensions of foundations.
- Details of setting out dimensions of foundation for every type of leg extension.
- Details of placing of all reinforcing steel, including type, size and length of all reinforcing steel and details of bar bending.
- Details of concrete to be used, including type and size of aggregate (aggregate grading), cement, water/cement ratio, slump, additives, methods of placing, formwork and required test cylinders, etc..
- Protection of steel reinforcement.
- Details of the individual stub angles supporting device for each type of tower foundation for the approval of the Employer.
- Prepare plans and profiles for any diverted sections of the line.
- Excavation details and setting template cross reference details.

4.11.11 Submittals

Submittals required with tender include:

- The Technical Data Schedules of this specification for each type of proposed foundation.
- Outline drawings of proposed foundations showing loadings, key dimensions, concrete and excavation volumes.

Submittals required following the award of the contract are four copies each of:

- Detailed calculations for the foundation design loads and diagrams showing all foundation design assumptions.
- Drawing of tower footings and stubs to be buried into the concrete or grillage foundations.
- Final design drawings complete with reinforcement details, excavation and concrete volumes.

4.12 Surveying and Tower Location

4.12.1 General

For bidding purposes, a Route Map in PDF of the proposed line and a PDF profile including suspension tower and angle tower coordinates has been included in this specification.

Tower types and tower extensions and their quantities are provided as the basis of bidding for all Bids and are set out in the Schedule of Prices.

The Contractor shall execute the works in accordance with Contractor’s own survey, tower design, material schedule and soil test data, etc.

4.12.2 Preliminary Survey

The Employer has carried out a detailed alignment and provided a PDF profile of the proposed line route which includes the determination of all tower locations on Plan and Profile drawings, and anticipated tower types along the entire route.

The Contractor will be required to carry out a detailed topographic survey to select and confirm the alignment, undertake tower spotting and profile survey of the approved route and provide a PLS-CADD profile. The bidder shall enter a rate for “detailed survey” which shall cover all the necessary operations on the basis of the information provided.

Should it be determined that a re-alignment and or re-clearing be required due to unforeseen reasons, this will be subject to prior approval of the Engineer. The Contractor will be required to survey and provide a PLS-CADD profile accordingly for any re-alignments at the rate provided for re-alignment survey and re-alignment bush clearing.

4.12.3 Final Survey and Design Confirmation

The Contractor shall perform the final check, survey, pegging out of all terminal, angle and tangent positions of towers along the selected line route as approved by the Employer. The Contractor shall be required to take diagonal levels across each tower site to confirm tower body extension requirements and determine any requirements for tower leg extensions and/or foundation extensions, while minimising the need for benching and ensuring minimum conductor clearances to the ground are maintained.

Surveying works shall be performed by qualified, experienced personnel supervised by a qualified surveyor. Surveying team qualifications and proposed surveying equipment shall be submitted for approval, not less than 15 days prior to start.

It is the responsibility of the Contractor to carry out its Profile Survey to confirm and/or amend the Employers preliminary survey and produce Plan and Profile drawings and PLS-CADD files in respect of their proposed alignment, tower locations and types, through the following principal tasks:

- Check the line route as provided by the Employer, carry out a detailed survey and provision of a PLS-CADD file with tower spotting as necessary for the construction of the line in keeping with the Employer’s “best practice”.
- Provision of a detailed route map to a scale of 1:25,000 (or other approved scale), clearly showing angle points and their coordinates.
- Any proposed changes to the line route shall also be shown on 1:25,000 route maps (or other approved scale), justified by the Contractor and the approval of the Employer obtained in writing.
- Check the ground elevations at the tower locations and at the points of minimum clearance of conductors to ground.
- Check all the tower-to-tower distances.
- Exercise full Project Management line design responsibilities of the Contractor and ensure the observance of all specified clearances and of tower capabilities.
- The PLS-CADD profile scale shall be 1:2000 horizontal and 1:200 vertical and the profile shall be drawn from left to right on the sheet, complete with the photo imagery.

4.12.4 Required Information

The Contractor shall survey, report and prepare in digital data format as well as on the plan and profile drawings all information regarding the following items within a band width of 50 m along the survey centre line: (centre line + 25 m).

- a) Roads
 - Identification.
 - Name of adjacent tower
 - Surface type.
 - Class (main, secondary, private, bush, etc.).
 - Angle of crossing.
 - Chainage of the centre line and road limits.
 - Elevation of highest point of road surface, shoulder and ditches.
 - If the road is curving, additional data to define the curve of the road
 - The location of any mile post or sign board with the description, if located within 100m of the crossing point.
- b) Tracks and Trails
 - Chainage and approximate angle of crossing.
 - Elevation.
- c) Railways
 - Identification.
 - Chainage of centre line and boundary limits.
 - Angle of crossing.
 - Elevation of top rail.
- d) Power and Communication Lines
 - Owner.
 - Voltage.
 - Type of construction.

- Angle of crossing.
 - Chainage at point of crossing.
 - Distance from the point of crossing to the adjacent support structures.
 - Elevation of the ground at the point of crossing and at the adjacent support structures.
 - Elevation of the top wire at point of crossing and its attachment points to adjacent support structures.
 - Temperature at the time of recording the elevations.
 - A pole or structure number and the line name
- e) Fences
- Chainage and approximate angle of crossing.
 - Ground elevation and fence height.
- f) Property Divisions
- Chainage and approximate angle of crossing.
- g) Permanent Buildings
- Chainage/Offset Distances and elevations of corners.
 - Height.
 - Type of roof.
- h) Temporary Buildings
- Indicate on plan and profile for purposes of establishing quantities and clearance.
 - Height.
- i) Ditches and Streams
- Chainage, width and approximate angle of crossing, ground elevation at edges location.
- j) Mounds, Farms and Outcrops (including termite/ant hills)
- Type.
 - Chainage, offset distance and ground elevation at edges.
 - Height.
- k) Ground Types
- Chainage of positions where ground type changes.
 - Definition (normal Soil, soft Soil, clay, sand, swamp, rocky outcrop, solid rock, etc.).
- l) Pipelines and Buried Cables (if any)

Record and report on the plan and profile drawing any information which may be useful or have effect on the line construction. Include future developments in this category:

- Type, name and size.
- Chainage and angle of crossing.
- Ground elevation and buried depth
- Right of way width and ground elevation at right of way limits.
- Location of any identifiable mark on the pipeline route

4.12.5 Transmission Line Survey Drawings

The Contractor shall provide digital data format (PLS-CADD file), as well as plan and profile drawings of the transmission line survey.

These shall include all survey data and shall:

- Show all features such as hedges, fences, ditches, roads, railways, streams, buildings, huts, power and communication lines, pipelines, existing service lines, and property lines.
- Show the respective angles of intersection with the survey centre line, chainage, elevations, heights, etc., for all features as taken during the survey.
- Indicate the nature of ground, whether cultivated (including type), grassland, scrub, bush, etc., and make special references to abnormal conditions: i.e. swamp, soft ground, etc., and any of the relevant information, such as Soil instability.
- Show section changes clearly. Section lengths not to exceed 5km.

4.12.6 Tower Location

4.12.6.1 Plans and Profiles Drawings and Tower Spotting

The Contractor shall submit for the Employer's approval final plan and profile drawings including tower spotting. Plan and profile drawings shall include the tower spotting using the latest edition of PLS-CADD Software.

The optimized tower locations shall be plotted on the plans and profiles using PLS-CADD and shall comply with the span limitations and clearance requirements.

For all towers, the Contractor shall ensure the following:

- The weight and wind spans are not more than those used for the design.
- The cold curve weight span is not less than specified.
- Clearances specified are satisfied.
- The foundations and towers are loaded within their specified design capacity.

In addition, the following information shall be shown on the plan and profile drawings:

- On the profile view: Each tower should be provided with an identification number, type, body & leg extensions, chainage and ground elevation at each tower location. individual and equivalent span lengths. maximum conductor sag curves and clearance curves. the land usage. all crossings with clearances to them indicated. structures etc.
- On the plan view: identification number at each tower location, line deviation angle and cumulative chainages at each line angle and dead-end tower.

4.12.6.2 Tower Schedule and Material Lists

The Contractor shall prepare the tower schedule for entire length and submit it to Employer for approval before start of work. The schedule shall include, but is not limited, to the following information:

- Construction number.
- Final number.
- Foundation type.
- Tower types.
- Body and individual leg extensions.
- Individual spans and sections ruling spans.
- Chainage equations.
- Line deviation angles.
- Weight and wind spans for each tower.
- Tower crossing details (streams, ditches, roads, power lines, etc.).
- Grounding type/reading
- Type of insulators sets.
- Applicable jumper sets.
- Number of dampers per tower.
- Number of spacer dampers per span.
- Armour rods.
- Cable joints, splices, repair sleeves and any other required information.
- OPGW assemblies – suspension and tension
- OPGW Joint box location
- Overhead ground wire assemblies – suspension and tension
- Provisions for remarks, revisions and final structure numbers.

4.12.6.3 Tower Staking

The tower staking shall be performed by qualified and experienced personnel and supervised by a qualified surveyor.

The Contractor shall locate all towers at the station shown on the plan and profile drawings plus or minus 0,3 m. The maximum allowable lateral offset of a tangent tower from true centre line is 0,1 m.

Where unequal tower legs are required, the Contractor shall perform site surveys and prepare diagonal profile and plan drawings for the final selection of individual leg extensions with the aim of minimising benching requirements. The Contractor shall assume full responsibility for the selection of all individual leg extensions and foundation extensions.

At each tower site, the Contractor shall provide three (3) stakes on the centreline of the transmission line. One stake is to be located at the centre of the proposed tower location with the other two reference stakes located on the centreline of the transmission line, 15 m ahead and behind the centre stake. The top of the centre stake shall be driven to an elevation to be known as the working point from which the line and level of the tower shall be established. At deviation or angle structures the Contractor shall also provide orientation pegs along the bisector of the deviation angle of the line prior to setting out of excavations.

4.12.7 Special Survey Requirements for the Euphorbia Critical Habitat Area

In addition to the general survey and tower location requirements, the Contractor shall perform a dedicated micro-siting Survey for the section of the 330kV line passing through the Mwela Rock Heritage Site. This survey shall:

- Utilize high-precision LiDAR and/or precision GPS to accurately map the location of all Euphorbia Perplexa Var. Kasamana outcrops within a 100-meter-wide corridor centered on the proposed line route and within Contractor’s work and access area.
- Produce a detailed Constraint and No-Go Zone Map for approval by the Employer and E&S specialist. This map will serve as the definitive guide for locating access paths and confirming final tower positions.
- Confirm that the final approved locations for the towers and the route of any manual access paths avoid all demarcated "No-Go Zones." No physical site work in this area shall commence until this map is formally approved.

Full details on biodiversity requirements are in the Biodiversity Management Plan (BMP) report attached. The bidders shall ensure that all provisions of the BMP are complied to and costed accordingly.

1.1 Geotechnical Investigation

4.12.8 General

The geotechnical report information shared herewith in the tender is for bidding purposes only and has been utilized to prepare estimates of quantities of foundation classes.

The Contractor shall undertake sufficient soil investigation and geotechnical investigation works to satisfy themselves that the proposed foundations to be installed at each tower location are fit for purpose. Where foundation classes as established by the contractor significantly differ from those of the bid, the rates for the different foundation classes as per Price Schedule shall be used for any changes subject to approval by the Employer. As part of this process the Contractor shall, as a minimum, undertake the following:

The Contractor shall provide a Desktop Study and Survey to include geological data, topographical information, expected hydrology and hydrogeology conditions. The desktop study shall include any geotechnical or hydrogeological hazards and restrictions of land use, including slopes, soft ground, vegetation, flood plains, watercourses in close proximity, landslips, faults, made ground or mining. The Contractor should provide a tabulated assessment of each ground investigation location as part of the desktop study report.

The desktop study should also include the soil investigation data provided with this document and any information relating to geology maps or previous site investigation studies obtained.

Once the overhead line route has been agreed and angle tower positions established, the Contractor shall undertake geotechnical investigations in sufficient detail to permit the Contractor to design and install each foundation satisfactorily at every tower location. Geotechnical investigations shall be in accordance with BS 5930, or other approved standard specification, and generally incorporate field assessments, ground investigations, sampling, and laboratory testing. Sufficient ground investigation data shall be made available to confirm foundation suitability and constructability.

The Contractor shall obtain information on ground properties of the various underground strata in which to provide sufficient soil, rock, and groundwater data for use in the uplift and compression design and checking of each foundation. In this respect a sufficient number of angle positions and intermediate tower sites shall be investigated by borehole in soil, or rotary drilling and coring in rock, to confirm or adjust the parameters for standard foundations given for bid purposes in the Schedules. The number and frequency of boreholes taken may vary along the route, shall be determined by the variability or suitability of the soils encountered and shall be subject to approval by the Engineer/Employer. In-situ testing in boreholes shall include either Standard Penetration Testing (SPT) or Shear Vane Testing (SVT) as a minimum. SPT shall be carried out in accordance with ISO 22476, or other approved standard specification.

Laboratory testing shall be carried out on retrieved soil samples in accordance with BS 1377, or other approved standard specification, and shall include one or more of the following methods of testing:

- Triaxial shear strength testing (cohesive soils)
- Direct shear strength testing (granular soils)
- Soil density
- Particle Size Distribution (sieve analysis)
- Moisture content
- Atterberg limits (plasticity, liquidity, and expansion indices)

Laboratory testing shall be carried out on retrieved rock samples in accordance with ISRM procedures and shall include one or more of the following methods of testing:

- Unconfined Compressive Strength (UCS)
- Point Load Test (PLT)
- Rock density

Where foundation excavations are to be of the open-cut type, the properties of compacted backfill are also to be examined and tested and related to undisturbed soil properties in accordance with the schedule on foundation tests. On completion of profiling and tower spotting, in order to provide adequate correlation where boreholes or rotary holes have not been undertaken, the main sites and every tower position shall also be investigated by one or more of the following methods:

- Dynamic Cone Penetration Testing (DCPT)
- Static or Dutch Cone Penetration Testing (CPT)
- In-situ Plate Bearing Testing (PBT)
- DCPT shall be carried out in accordance with ISO 22476, or other approved standard specification.

Soil and/or rock engineering descriptions shall be provided on a log at each probe site. Rock Quality Designation (RQD) shall also be provided where rock cores are taken.

Ground investigation, in-situ testing, and sampling at each tower site shall be by use of an approved type of penetrometer or borer.

The Contractor shall be responsible for any subsidence or failure due, in the opinion of the Engineer/Employer, to insufficient care having been taken in his examination of ground conditions or in installation of the foundations. The ground investigation carried out by the Contractor during survey shall be expected to provide sufficient data to permit the Contractor to design and install each foundation satisfactorily. Where towers are deemed to require special foundations but do not fall on a scheduled main investigation site, additional ground investigation should be undertaken, subject to the approval of the Engineer/Employer, to extend and correlate data.

In the rare case where, additional investigations may be required to enable the type and size of a special foundation to be determined, the Engineer/Employer may instruct a ‘specialist’ ground investigation to be carried out with a report and recommendation submitted.

Proposals shall initially be submitted for approval. The report shall, as a minimum, include details of the field work undertaken, field logs, the results of in-situ and laboratory testing, interpretation of the results, and recommendations for design and construction.

Additional probe tests, as well as any other tests the Contractor deems necessary, should be carried out in areas of variable ground condition where the Contractor may wish to propose selective movement of some foundation locations. Where soil probing indicates the possibility of rock due to ‘refusal’ of

the probe test, the Contractor shall confirm by carrying out further probe tests at an adjacent location or by drilling that rock, to confirm that an isolated boulder has not been encountered.

Further tests subject to the approval of the Engineer/Employer may be required to determine the rock quality. Sites with additional tests approved by the Engineer/Employer shall be paid at the rates stated in the price schedule. Subject to the approval of the Engineer/Employer, the parameters obtained from the bore holes and sub-surface probe tests shall be classified into typical groups and employed in the designs of all foundations. The results of all soil and rock tests shall be submitted to the Engineer/Employer, together with any proposals that the Contractor may consider necessary, to ascertain the parameters and dimensions for the standard foundations given in the Schedules or the need for special designs.

Prior to construction the Contractor shall submit for approval his proposals for correlating the results of the detailed ground investigations and the soil and rock tests undertaken at each site with the parameters employed for the foundation design. These proposals shall also consider visual and manual checks and tests to be made after excavation and shall be to the Engineer's/Employer's approval. The Contractor shall prepare and update the Line Schedule for construction purposes that clearly indicates the class of foundation to be installed at each site and records the soil investigation data on which the choice has been made. The schedule will be subject to approval of the Engineer/Employer prior to commencement of foundation construction.

When required by the Engineer/Employer, the Contractor will be required to make arrangements for a special comprehensive ground investigation to be carried out at any specified tower site, including deep borings and laboratory analysis of undisturbed soil samples, and for a report and recommendation to be submitted. The Engineer/Employer may require that this work shall be carried out by an approved Subcontractor at rates to be agreed.

4.12.9 Boreholes

The Contractor shall provide soil investigation works along the proposed overhead line route, including full soil investigation at least at every overhead line route angle point or section tower, and at appropriate intermediate points as considered necessary, but at a maximum spacing of no more than 2.5km. The soil investigation is to include appropriate information to determine soil and rock classification, soil and rock strength parameters including shear strength parameters, bearing capacity of soils and rocks, density of soils and rock in both dry and saturated conditions. The soil investigation shall include a record of groundwater table depth, potential variation in depth and mobility of groundwater. The Contractor shall provide as part of the soil investigation for each location, boreholes and trial pits with recorded soil type and strata depth, groundwater or artesian water strikes. Any rock faults or state of rock weathering should also be recorded. Intact core samples should be taken where possible and logged using appropriate methods. Bulk samples should be obtained where core samples are not possible.

Standard Penetration Tests (SPT's) and/or U100 samples as appropriate are to be taken at approximately 1.5m intervals are required as a minimum at all ground investigation locations. Each borehole should continue to a suitable depth to either a firm soil stratum, rockhead, or a minimum depth not less than 10 metres for locations deemed suitable for shallow foundations and not less than 20 metres or until firm strata is encountered for locations where deep foundations may be required.

On completion of each borehole a piezometer standpipe shall be installed and monitored periodically to determine the water table level.

The Contractor should also undertake, adjacent to each bore hole, a ground penetration test, such as a Dynamic Cone Penetration Test (DCPT) or a Dutch Cone penetration test for the purposes of providing a correlation between SPT and DCPT or Dutch Cone values, to be used by the Contractor when undertaking such tests at each tower location prior to commencement of foundation excavation works to determine the foundation classification for each individual tower location. The number of blows or force required for each 10cm of penetration shall be recorded until the probe penetration is negligible after 50 blows or continue to a suitable depth to either a firm soil strata, rockhead, or a minimum depth not less than 6 metres for locations deemed suitable for shallow foundations and not less than 20 metres for locations where deep foundations may be required. These tests shall be considered part of the itemised costs for the boreholes in the Schedule of Prices.

The Contractor shall carry out laboratory tests including chemical composition of groundwater and soil samples to determine sulphate levels, acidic levels and corrosiveness. Laboratory tests shall include shear box or triaxial tests on granular and cohesive soil samples respectively to determine shear strength parameters, assessment of soil compressibility and consolidation ratio for cohesive soils. Unconfined Compression Strength (UCS) tests should be carried out on suitable rock samples.

4.12.10 Investigation of Soil at Each Tower Site

Investigation of soil at each tower site shall be conducted to provide the required data for the selection of the appropriate type of footings and grounding installations prior to their excavation.

The method of investigation shall be performed with identical equipment as used adjacent to the boreholes as described above. A test shall be conducted for each leg and the results used to assess the expected foundation type required. The results of which together with the Contractor's assessment is to be provided to the Employer for approval. The cost for these tests shall be considered as part of the foundation installation costs given in the Schedule of Prices.

As foundations are subjected to uplift and to compression loadings, the existing type of soil and foundation type to be installed shall be defined considering the soil located above and below the footing founding level. Investigation, at each tower site, must therefore be carried out to below the base of the footing to a depth of at least two times the anticipated base size below the anticipated founding depth.

Final selection and agreement of the foundation type to be installed at each tower location shall be subject to approval of the Employer following completion of the excavation works and prior to concreting.

Earth resistivity measurements shall be taken at every tower location and conform to the Four Point Method of IEEE 81.

4.12.11 Report of Soils Investigation and Foundation Selection

For each tower site, the Contractor shall prepare and submit a soil investigation report, describing the methods used, the selected type of soil according to the results of soil investigation, the range of soils encountered, and the foundation selected.

The following are expected to be presented in the final Geotechnical Report, inter alia:

- i. Location of sampling points (trial pits) and/or tower locations using a suitable coordinate system
- ii. General description of soil and vegetation along the project route including areas that are waterlogged or are susceptible to flooding
- iii. Detailed description of the soil strata with depth (lithological profile) using trial pits

- iv. Detailed description of soil samples, test method, limit of strata, ground water level, soil classification up to the depth of sub-soil test and results of any laboratory tests.
- v. Summary of Geotechnical test results and associated engineering parameters. (All required engineering parameters should be derived from actual soil tests as opposed to being inferred from other test results)
- vi. Bearing capacity results with depth

4.13 Installation of Tower Foundations

4.13.1 Excavation

Excavation for foundations shall include all the excavation required for the installation of foundations, levelling around the individual tower foundations, and grading or preparation for construction at the tower site. Adequate drainage shall be provided around the tower site. Generally, excavated material shall be laid aside to be used for backfilling and embankment at the tower site from which it was excavated, and the excess material shall be spread evenly around the site after completion of the foundation back filling. Improper, unstable material and surplus material shall be removed.

Tower bases should be cleared to allow reasonable spaces for construction works and manoeuvring of field vehicles.

At excavation depth, carefully grade the ground to a level plane and remove all loose or disturbed material. Compact any loose deposits for settlement control.

For over-excavation in rock not exceeding 300 mm, backfill to the correct level with approved backfill material, well compacted in layers not exceeding 150 mm.

For over-excavation in rock exceeding 300 mm, backfill to the correct level with lean concrete.

Keep excavations free of standing water, and remove any spoil, loose material, etc., prior to placing footing.

Where soil conditions are unstable, the Contractor shall protect the foundation by soil stabilisation or shoring of the excavation walls. All such shoring shall be removed when no longer required. If directed by the Employer, the Contractor shall supply and place a layer of crushed stone or dry concrete mix to stabilise the bottom of the excavation and absorb surplus ground water.

4.13.2 Confirmation of Soil and Selected Foundation

During the excavation works, it is possible that the Employer or the Contractor consider that the soil effectively in place does not match with the established one at the time of the investigation phase and that the selected foundation is not adequate.

In this case, the Contractor shall, with penetrometers or shear vane or with any other method and/or instrument previously approved by the Employer, measure the bearing capacity of soil in place to confirm the initial selected foundation. In the case where the choice of the selected foundation is confirmed, the construction works will progress normally by using the foundation initially selected.

If the initial choice cannot be confirmed, the Employer may request the use of a more appropriate foundation in place of the initial one or the repetition of the soil investigation with the same methods as initially used. This new investigation will have to be done near the tower site, in undisturbed soil (none excavated), at no extra cost to the Employer.

4.13.3 Backfill

Backfill shall be placed around the tower foundations. The material used for backfilling, the amount thereof, and the manner of depositing the material shall be approved by the Employer. The excavation shall be kept dewatered during placement and compaction of backfill. If concrete curing compound is used after forms are removed from concrete, the backfill shall not be placed until 8 hours after the curing compound has been applied to the concrete. Material removed in excavation, which is not suitable or is not required for backfill and embankment, shall be spread evenly over the site. Suitable borrow material shall be used in backfill to replace such unsuitable soil removed during excavation, as required.

Borrowed material shall be sand, gravel, crushed stone or any other material suitable for compaction and which is non-cohesive and of uniformly graded sizes.

The Contractor shall be responsible for investigating for and hauling the borrowed materials that are required for his works.

The backfill shall be placed in layers not exceeding 200 mm in thickness and shall be compacted to achieve the bulk density assumed in the design using a method of compaction included in the Contractor’s method statement and approved by the Employer. Backfilling only from one side or corner of an excavation hole shall not be allowed. In wet or flooded situations adequate provision shall be made to ensure the excavation is kept free from water whilst work is carried out. Stub setting templates shall not be removed before completion of backfilling.

All surfaces of the backfill around the concrete or stub shall be carried beyond the excavation boundary to an elevation of approximately 30 cm above the natural ground level and shall be gently sloped away from the footing pedestals to blend into the surrounding natural grade. Care should be taken to avoid damage to the concrete when depositing backfills. Backfill shall not be placed around any foundation for at least 7 days after the completion of the foundation concreting operation. Backfill material shall be clean and free from vegetation, pieces of timber, large stones, or other foreign matter.

The material to be compacted shall contain no stones greater than 10 cm in diameter. The material to be compacted shall be deposited in horizontal layers having a thickness of not more than 20 cm after being compacted as hereinafter specified. The distribution of materials shall be such that the compacted material will be homogeneous and free from clods, pockets, streaks or other imperfections. Placing operations shall be such that the materials will be blended sufficiently to secure the required degree of compaction, permeability and stability. Prior to and during compaction operations, the backfill material shall have the optimum practicable moisture content required for the purpose of compaction. The moisture content shall be uniform throughout the layers of backfill. The material shall be compacted by tamping machines and special care shall be taken to prevent wedging action against the foundation. The material shall be compacted to at least 95 % of the maximum density obtainable in the Standard Proctor Density Test as specified in ASTM D698 (Method A).

4.13.4 Footing Installation

4.13.4.1 General

The Contractor shall carry out all works required for installation of footings, grounding whenever required and all other currently required works.

The Contractor shall be entirely responsible for the exact footing installation, whether it be the location, the alignment or the elevation, all these in accordance with data and specifications indicated in the drawings and/or directly provided by the Employer.

Particular care shall be taken for the installation of the footings of the towers which shall be levelled so that similar points on each of the four footings of the tower are at the same elevation once assembled.

Lateral deviation of the tower positions shall be less than or equal to 15 cm when measured from the theoretical axis of the line.

Lean concrete shall be placed under the footing, (min. 7.5 cm thickness) and shall be deemed to be included in the price for foundations. **Furthermore, in accordance with BS EN 1992-1-1:2004 (Table 3.1) the grade of lean concrete shall not be lower than C12/15.**

4.13.4.2 Rock Anchor Footing

Anchor holes shall extend 100 mm beyond the grouted length of the anchor rods. After the drilling of holes for anchor rods, wash the holes and then blow out by air jet to ensure that no water, dirt or loose material remains. Tightly plug the holes if they are not to be grouted immediately and again wash and clean immediately before the placing of the bars and grouting.

When grouting, partly fill holes with an approved grout having a water-cement ratio of less than 0.4 (by weight). The use of expanding admixtures or others will be subject to the approval of the Employer. The grout shall have a minimum 28 day compressive **cube** strength of **37** N/mm².

Anchor bars shall be axially centred along the hole using centralizers approved by the Employer. Anchor bars shall be supported immediately after grouting in such a manner as to prevent any movement until the grout has hardened. The final position of each bar must be within the tolerances specified.

4.13.4.3 Reinforced Concrete Footing

The Contractor shall supply all labour, materials and equipment required for the concrete work, and all test thereon, and shall:

- Mix, transport, place, compact finish and cure all concrete.
- Erect and dismantle all forms and formwork.
- Fix all steel reinforcement, and
- Embed, as required, all items, whether supplied and erected by him or by other, in accordance with this specification and drawings.

Portland cement shall conform to BS EN 197-1 or ASTM C150. It shall be delivered to the Site in bulk cement containers or in sealed plastic lined bags clearly marked with the maker's name and shall be carefully stored in a waterproof shed with a raised floor or in a silo of approved design. Each consignment of cement shall be stored apart from earlier consignments and the cement shall be used in the order in which it is delivered. Any consignment which has become caked, or otherwise adversely affected, shall not be used and shall be removed from the Site immediately.

Test cubes of 150 mm face in accordance with BS 1881, or other approved standard specification, shall be made during the progress of the works, comprising a minimum of one set of four cubes per tower or per day, or one set of four cubes for each 6 m³ of concrete placed if greater. Cubes shall be tested in accordance with BS 1881, or other approved standard specification, and Clause 16 of this Technical Specification.

All aggregates shall comply with the requirements of ASTM C33 in all respects and shall be subject to the appropriate tests. For both the fine and coarse aggregates proposed to be used for the works, the Contractor shall furnish samples to the Employer together with such full details as the Employer may require. No aggregates may be used in the works until they have been approved by the Employer. During the work, the Employer shall order such tests as he may consider necessary on the aggregates, and any aggregates found to have unsuitable characteristics, at any time, shall not be used in the work and shall be removed from the Site.

The various fractions of fine and coarse aggregates shall be stored separately and in such a manner as to avoid the admixture of dirt in the concrete. Aggregates shall be handled in such a way that separation is avoided. The proportions of fine and coarse aggregates shall be suitable for making a dense concrete of appropriate workability, containing the proportions of cement and water prescribed. The proportions of fine and coarse aggregates to be used shall be approved by the Employer.

The Contractor shall be responsible for mixing the aggregates in the proportions approved by the Employer. He shall submit samples of the concrete material to the Employer well in advance of commencing any concrete work, and also have test cubes made and tested from the aggregates and the cement he intends to use. Concrete works must not commence until such samples and tests are to the Employer's satisfaction.

Water used in mixing concrete, mortar and grout, shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that may be deleterious to concrete and steel. Mortar cubes made with non-potable mixing water shall have 7 days and 28 days strengths equal to at least 90 % of the strengths of similar specimens made with potable (drinkable) water.

Water-reducing admixtures, retarding admixtures, accelerating admixtures, water-reducing and retarding admixtures, and water-reducing and accelerating admixtures, if used, shall conform at BS EN 480 or ASTM C494. Air-entraining admixtures shall conform to BS EN 934 or ASTM C260. No admixtures shall be used without approval. No admixtures containing more than a trace of chlorides shall be used.

The steel reinforcement shall consist of hot rolled deformed bars conforming to the requirements of BS 4449 or ASTM A615 with minimum yield strength of 410 N/mm². The number, placing and fixing of bars shall be in accordance with the drawings and approved bar bending schedules, or otherwise, as directed by the Employer.

All placed and fixed reinforcement shall be free from loose mill scale, loose rust, oil, grease or other deleterious material and shall be approved by the Employer before commencing any concreting.

4.13.4.4 Concrete Mixing

The Contractor will be required to proportion the materials by weight at all times, and the Contractor will be responsible for providing an adequate, approved, and regularly calibrated batching plant for this purpose, to the satisfaction of the Employer.

All concrete shall be machine-mixed. The type of mixer shall be approved by the Employer.

The slump of the concrete shall normally be between 100 and 150 mm corresponding to plastic consistency.

When the air temperature rises above 30°C, special precautions shall be taken to the satisfaction of the Employer, to cool aggregates and mixing water and to maintain the correct water/cement ratio. Concreting shall not be carried out when the air temperature rises above 45°C.

Ready mix concrete, if approved for use, shall conform to BS 5328, BS 8500 or ASTM C94 with minimum cement content of 300kg/m³ concrete, maximum water cement ratio of 0.6.

4.13.4.5 Formwork

The Contractor shall be responsible for the design and construction of the formwork to be used for concreting. The formwork shall be rigidly constructed to represent the shape of the concrete, as detailed on the drawings. No concrete shall be placed until the Employer has examined and approved the formwork. Forms shall not be struck until a minimum of 24 hours, or as required by the Table 6.2 of the **BS EN 1992**, or other approved standard specification, has passed from time of completion of the concreting.

At the time the concrete is placed in the forms, the surfaces of the forms shall be free from encrustations of mortar, grout, loose rust, or other foreign material. Before concrete is placed, the surfaces of the forms shall be oiled with commercial form oil that will effectively prevent sticking and will not stain the concrete surfaces.

4.13.4.6 Placing and Compacting

Concrete shall be transported from the mixer to the place of casting. in such a manner that separation of the aggregates does not occur.

The concrete shall be placed in its final position, as soon as possible, and in no case more than half an hour after mixing. The method of placing shall be such as to ensure that the concrete in its final position may be dense and homogeneous.

Compacting shall be carried out in a manner approved by the Employer.

The concrete shall be vibrated or thoroughly rammed during placing to ensure that it is homogeneous and free from voids. Excessive vibration shall be avoided. Concrete shall not be directly poured from a height of more than 1.5 m to avoid mix segregation.

A minimum of two (2) functional vibrators should be on standby during concrete casting.

4.13.4.7 Surface Finish

Unless otherwise shown on the drawings, all permanently visible concrete surfaces shall have a regular finish of uniform texture, free from holes, pins and formwork.

Should any part of the concrete surface present a rough, uneven, honey combed, discoloured or imperfect appearance when the shuttering is removed, it shall be chiselled to such a depth and refilled and properly refaced with concrete. In the event of excessive porosity being discovered, the defective area shall be chiselled and made good as specified above. No plastering of such concrete areas will be permitted.

Concrete foundation edges above ground level and 300 mm below ground level shall be bevelled by inserting 25 mm triangular fillets in the formwork. The finished concrete surface shall be sloped away from the stub.

A 50mm fillet shall be provided between the concrete chimney and the concrete pad.

4.13.4.8 Curing

Concrete shall be cured by application of an approved concrete membrane curing compound. For the hot-dry region where the towers will be erected, a resin-base curing compound is more effective than water base curing. Membrane curing of concrete shall be made by the application of a sealing compound which forms a water-retaining membrane on the surfaces of the concrete. The sealing compound shall conform to ASTM C309 (Type 2), and its method of application shall be approved or directed by the Employer. In general, two coats of curing compound shall be applied to all exposed surfaces of fresh concrete, as soon as possible after concrete placement and finishing, and in no case later than one hour after placement. Formed concrete surfaces shall have two coats of curing compound applied within one hour after form removal. Any sealing membrane that is damaged or that peels from concrete surfaces within 7 days after application shall be repaired without delay and in an approved manner.

The costs of furnishing and applying all materials used for curing concrete shall be included in the unit price for the foundations.

4.13.4.9 Field Control of Concrete Strength

The Contractor shall provide testing equipment and take one set of four cubes taken from fresh concrete for each tower foundation but not less than four cubes for each day of concreting. Concrete cubes shall be cast in accordance with BS 1881 Part 108 and cured in accordance with BS 1881 Part 111.

If air entrainment is used, tests shall be made, and results shall conform to the agreed mix design percentage.

The strength of concrete shall conform to the requirements of the specification, concrete strength test results shall be in accordance with the requirements of BS 5328 Part 4 Cl 3.16.2. If strength tests fail to conform to the requirements, the Employer may require such changes in concrete proportion as will be necessary to secure the required strength.

Furthermore, the Employer may require compression tests on hardened concrete in accordance with ASTM C42 for that portion of the foundation where the questionable concrete has been placed.

4.13.5 Tolerances

Foundation setting tolerances shall be in accordance with the requirements stated below. The difference in elevation between the tops of any two stub angles shall not exceed 1/1000 of the horizontal distance between the stubs. The actual elevation of any stub angle shall not differ from the computed elevation by more than 1/100 of the foundation depth. Stub rake shall be within 1 % of the required hip or face rake.

Back-to-back dimensions at top of stubs shall be within 10 mm on the face or within 15 mm on the diagonal. The twist of any stub in plan shall be less than 1° about the longitudinal axis.

Tolerances for the position of the tower and excavations in relation to the tower position given on the profile shall be:

Tower	Out of alignment	From centre line of route	From transverse centre line of tower
Suspension tower	0.25°	±25 mm	±25 mm
Tension tower	0.25°	±25 mm	±25 mm

4.13.5.1 Site clearance

As soon as practicable at each tower site, backfilling shall be completed, surplus soil removed, and the site cleared. Final site clearance will normally be carried out at the same time as

fitting of anti-climbing devices and tower plates and shall be undertaken without delay.

4.13.5.2 Protection of tower footings

At locations where water due to flood or tidal water may affect the foundations or cause erosion of the ground near the tower foundations, protection to the foundations and to the ground surrounding them shall be provided by the Contractor. Methods include extended concrete chimneys, stone revetment, concrete placement, gabion structures or reinforcement of ground surfaces as well as drainage schemes as necessary. Other methods, where more suitable, are not precluded and the Contractor shall furnish recommendations for the provision of protection at such locations.

4.13.6 Special Construction Constraints for Tower Foundations in Euphorbia area

The installation of foundations for towers in the Euphorbia Area shall be performed under the following strict conditions:

- **Prohibition of Heavy Machinery:** All foundation excavation, concrete mixing, and pouring shall be performed using manual labor and/or portable mechanical aids (e.g., handheld augers, portable mixers) pre-approved by the Engineer and project ecologist. The use of vehicle-mounted excavators, concrete trucks, or cranes is strictly forbidden within the demarcated sensitive area.
- **Material Transport:** All materials, including cement, aggregates, water, reinforcement steel, and foundation stubs, shall be transported to the tower locations via manual labor along approved access paths. If there will be no impact or risk for the critical habitat created by downforce wind, helicopter airlifting of equipment (such as excavators, drill rigs, tower components, insulator strings, and hardware) can be used.
- **Ecological Supervision:** All foundation activities, from marking the excavation area to backfilling and site restoration, require the on-site supervision and approval of the designated project ecologist.

4.14 Grounding Installation

4.14.1 Tower Grounding

All towers shall be permanently and effectively earthed.

The Contractor shall measure the ground resistance of individual towers with the measuring instruments and methods approved by the Employer, and when required, in the presence of the Employer. The records of these measurements shall be submitted to the Employer who will determine the necessity for additional grounding. Date, temperature, resistance and soil condition will be recorded whenever ground resistance is measured.

All towers shall be grounded in accordance with the specification and approved drawings. Materials to be installed include, counterpoise and necessary fittings, as per contract specification and drawings. Grounding shall be installed in accordance with procedure outlined below to attain the necessary resistance. Readings of tower resistance shall be furnished to Employer after each step.

Towers, including the terminal tower, located within 1.5 km distance from the substation shall be bonded by underground continuous counterpoise to the substation earthing system and no additional earthing will be required for the substation approach towers.

Short circuit currents for selected buses are presented in the table below. The contractor shall however validate the short circuit currents for the design of the tower footing earthing.

			No lines	1 Line				2 Lines			
Bus no	Substation	Voltage (kV)	Kout_Lout (A)	Kout_Lout (A)	Kout_Lin (A)	Kin_Lout (A)	Kin_Lin (A)	Kout_Lout (A)	Kout_Lin (A)	Kin_Lout (A)	Kin_Lin (A)
222	TUNDUMA 330	330	2,191	3,132	3,432	3,533	3,651	3,650	4,038	4,182	4,406
1001	MPRKS330	330	1,017	1,574	2,512	3,057	3,997	1,857	2,794	3,339	4,286
1002	KALUNGWISHI	330				3,176	3,732			3,355	3,880
5231	LUFUBU	330			2,396		3,383		2,602		3,550
5240	KABWE3	330	16,059	16,498	16,609	16,643	16,680	16,729	16,877	16,925	16,860
5246	PENSL3	330	3,666	4,270	4,450	4,508	4,571	4,655	4,936	5,035	5,153
5272	KASAMA	330	1,356	2,606	3,347	3,659	4,070	3,513	4,255	4,568	5,005
5274	NAKONDE	330	941	3,128	3,428	3,530	3,648	3,647	4,036	4,181	4,405
10114	TUNDUMA 400	400	2,237	2,976	3,192	3,263	3,343	3,341	3,599	3,691	3,870
10519	MPIKA	330	1,936	2,739	3,045	3,150	3,273	3,721	4,140	4,298	4,498
40210	MBEYA 400	400	2,674	3,372	3,561	3,622	3,691	3,690	3,904	3,979	4,176
42101	KISADA 400	400	3,469	4,069	4,217	4,263	4,315	4,316	4,472	4,526	4,782

4.14.2 Details of Grounding (Earthing)

Each tower shall be earthed at two diagonally opposed footings. The earthing counterpoise cables should be buried and continue out to the edge of the 20m corridor at 45 degrees to the line direction, and then parallel to the line for a total length of 20m. The cable should pass through the concrete and exit the chimney at 0.5 – 0.8m below ground level to avoid theft.

Connection of the counterpoise to the tower steelwork shall be by means of a compressed tinned lug and two galvanized bolts, nuts, washers and spring washers on the tower stub in a way that no more than 20 mm of counterpoise cable is exposed above the foundation surface. The minimum diameter of the bolts shall be 12 mm. The holes in the leg/stub steelwork shall be factory drilled prior to galvanizing.

Earthing cables (counterpoise) shall be of 40% conductivity (CCS40) copper clad steel wire strand 7 No.7 AWG or similar with minimum short circuit capacity of 195kA²s.

The earthing counterpoise shall pass through the concrete chimney via an encased, flexible PVC pipe and exit from the chimney at the required depth. On completion of the earthing installation the PVC pipe shall be filled with a cement mortar mix.

The depths of burial of earthing cables shall not be less than the following values:

- Cultivated (soft) soil 800 mm
- Normal soil 500 mm
- Rocky ground 150 mm

Use of alternative counterpoise strip earthing in rocky areas is subject to Employer approval.

Type A Every tower shall be fitted with compulsory earthing on two diagonally opposed legs. The counterpoise cable shall extend 20m to the edge of the cleared corridor.

Where the measured tower footing resistance is greater than 10 Ω the earthing shall be enhanced using one of the systems detailed below.

4.14.3 Extensions to Grounding (Earthing)

At tower positions where the earthing as specified in **Type A** is inadequate the earthing shall be improved in the following way with the approval of the Employer:

Type B: Installation of two additional lengths of counterpoise attached to the remaining two legs extending 20m to the edge of the cleared strip.

This type of earthing system shall be used in cultivated (soft) soil where type A earthing does not provide adequate earthing.

Type C: Installation of an additional 20m to each of the 4 counterpoise cables running parallel to the overhead line but remaining within the overhead line corridor.

This earthing system shall generally be used where the ground conditions are not favourable, but not rocky.

If, following type C enhancement, the footing resistance is less than 10 Ω , then no further earthing extensions will be required.

Type D: Any special measures and methods (deep grounding, counterpoise connection to the adjacent tower, earth conductivity improving chemicals etc.), subject to approval of the Employer, which shall be used in specific soils where Type C earthing cannot provide a sufficient reduction in resistance. Type D enhancement shall not commence prior to approval from the Employer.

4.14.4 Tests on Site

4.14.4.1 Procedure

Following the completion of each earthing system at the tower location, but before conductor or earth wire stringing works and before connecting the earthing to the steel tower or stubs, the Contractor shall measure the earthing resistance, in the presence of the Employer. The Employer shall be advised in due time, so that he will be able to send his representative.

For all types of earthing system, each section of earthing cable shall be separately bolted to the tower in order that it can, if required, be disconnected for the purpose of earth resistance measurements.

At each tower connected to an earthing system the Contractor shall measure the electrical footing resistance to earth with the system connected. The measurements shall also be recorded by the Contractor on the tower footing earth resistance profile to be provided as a final record.

Terminal towers and gantries shall be connected to the substation earthing grid.

Metal roofs of existing buildings constructed within 30 m of the centre of the transmission line shall be securely earthed. A minimum of two earth connections shall be made to opposite sides of the roofs by means of earthing (counterpoise) cable, which shall be led down the sides of the building to earth. The earthing cable shall be securely fixed in cleats to the sides of the buildings and not less than 2 m of the cable shall be buried in the ground at a depth of at least 800 mm.

All metallic fences both new and existing, which cross under, or which are located near and parallel to the transmission line shall be earthed as follows:

- One earthing rod shall be used to ground each 100 m of fence that is parallel to and within 50 m of the centre line of the transmission line. One earthing rod shall be used on each side of the right of way to earth fences crossing under the line.
- Earthing rods, to which the fence wires shall be bonded, shall be driven to a depth of not less than 1.5 m. All metallic fence gates within the right of way shall be electrically bonded to the fences.

In case the Employer makes its own tests, the Contractor shall provide the personnel and measuring equipment needed.

If the earthing system is already connected to the tower, it must be disconnected during the tests.

4.14.4.2 Decision upon Tests

In all cases the earthing resistance shall not exceed the values stated in the relevant Technical Data Schedules. Based on the results obtained, the Employer shall notify the Contractor if the earthing must be improved by means of additional wires and rods or extensions to the earthing wires.

For very severe conditions, higher resistance may be allowed, but only with the specific approval of the Employer. In this case the following shall be considered:

- The total quantity of these shall not be more than 20% of the total earthing resistance of the line.
- Any one of these earthing resistances shall not be more than three spans from an earthing resistance not exceeding 5 Ohms.

If 5 Ohms footing resistance is not obtainable with Type A, the Contractor shall seek approval from the Employer to proceed with further steps.

4.14.5 Final information

The Contractor shall supply the following information:

- Instruction manuals and pamphlets - after erection - for each tower or other earthed object.
- Layouts of as built earthing equipment, nature of the soil and measured earth resistance (test report).

4.15 Erection of Towers

4.15.1 General

The Contractor shall erect the towers and accessories in accordance with the approved detail shop and construction drawings. Towers shall be complete with all members in place and bolts, including step bolts, securely tightened before any stringing work is started. Unless otherwise approved, towers with concrete foundations shall not be erected until the concrete has had 14 days in which to cure, or such longer or shorter time as may be approved, depending on the type of cement used, and provision of adequate concrete cube tests, as approved by the Employer.

The Contractor shall ensure that all staff, including those of Subcontractors, employed in erection activities are properly trained and experienced in working on structures above ground level. All staff should be provided with and fully trained in the proper application and use of all PPE and other safety devices as required by the approved HSE Plan, method statements and any other statutory requirements.

4.15.2 Handling and Storage

In storage and at tower site, all tower steel shall be kept clear of the ground in a clean and tidy condition. Contact with standing water or other substances likely to attack galvanizing shall be avoided.

Care shall be taken during handling and storage to prevent structural injury to members or damage to galvanized or other protective surfaces. No steelwork shall be dragged over the ground surface or handled in such a manner as to damage the galvanized surfaces. Throwing of tower steel into piles on conveyances, onto the ground, or skidding of steel members over each other is not permitted.

All superficial rust stains, corrosive salts and other foreign materials deposited prior to or during installation of the towers shall be removed without causing damage to the protective surfaces.

4.15.3 Erection Procedures

The towers may be erected by assembling in sections on the ground and hoisting or lifting successive sections into place, or they may be erected in place on the footings by installing individual members at the option of the Contractor. The tower erection procedure(s) shall be submitted to the Employer for approval in advance of actual erection.

Slings and other equipment used for picking up members, portions of towers or complete towers, shall be of such materials or shall be cushioned in such a manner as to prevent cutting into the corners of members, damaging the finish, or distorting or overstressing members when lifts are made. The method of assembling and erecting a tower shall be such that during erection no member shall be subjected to any stress in excess of that for which it was designed.

Members, portions of towers, or complete towers shall be raised in such a manner that no dragging on the ground surface or against portions of towers already erected will occur.

Contact surfaces of members forming joints shall be clean before members are assembled.

Proper precautions shall be taken to ensure that towers are not strained or damaged in any way during erection. Suitable ladders shall be used, whenever necessary, during erection of towers. All ladders and removable step bolts shall be removed when erection work is not in progress.

All towers shall be vertical under the stresses set up by the overhead line after conductor erection. A tolerance of 25 mm for every 10m height from the true vertical axis may be allowed.

The location and orientation of towers at the ends of the line are to be studied with extreme care. Coordination with substation Contractors/staff is the responsibility of the Contractor. Final design drawings of the interfacing parts of the project shall be signed by all interested party and shall be presented to Employer. Method statements and drawings with sufficient detail are to be provided prior to outages being granted. Outage dates and outage durations are to be requested well in advance to allow Employer sufficient time to arrange these outages.

Proper precautions shall be taken to ensure that towers are not strained or damaged in any way during erection. Suitable ladders shall be used, whenever necessary, during erection of towers. All ladders and removable step bolts shall be removed when erection work is not in progress.

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4.15.3.1 Fall Arrest System

The Contractor shall provide installation of a fall arrest system at all suspension and tension towers at the time of construction/tower erection to provide protection to personnel in case of a fall from height. The Fall Arrest shall be a vertical fall protection system installed on the overhead line tower climbing legs. The tower attachment device shall incorporate built-in energy absorbing pack to reduce end load in event of a fall. The System shall be used by four (4) workers simultaneously. The vertical system shall allow free climbing while maintaining 100% tie-off.

The fall arrest system shall be installed starting at 3m above ground level up to highest level of the tower and both earth wire peaks.

4.15.4 Special Erection Constraints for Euphorbia area

The towers in the environmental sensitive Euphorbia area, requires special consideration for transport of material and equipment, as well as for the erections works.

The erection of towers should proceed only after approval of a site-specific erection methodology that adheres to the following:

- **Erection Method:** Towers shall be erected using the piece-by-piece method. The use of heavy-lift mobile or crawler cranes for erection is prohibited. The Contractor shall use gin poles, derricks, or other approved lightweight lifting systems or manual erection method that can be assembled and operated manually or with small winches located outside the sensitive area.

- **Method Statement:** The Contractor should submit a detailed Manual Erection Method Statement for the towers. This document must outline the specific equipment, personnel safety protocols, and sequence of assembly that complies with all environmental and logistical constraints for this location. Erection shall not commence until this method statement is approved by the Employer.

4.15.5 Bolt Tightening

During tower erection, bolts shall be finger-tightened only. If erected by assembling in sections, the initial tightening of bolts shall be adequate for dead load, live load and direction stresses, but shall not be so strong as to prevent aligning and fitting of adjacent sections or members.

The assembled sections shall be adequately supported during erection.

After the complete tower is erected, the nuts for ASTM A394 bolts shall be tightened to the following torques:

Table 8 - Bolts' tightening torque

Size of Bolts (mm)	Tightening Torque (kg - cm)
12	500 - 600
16	1,000 - 1,200
20	1,400 - 1,800

Bolt tightening torque for bolts other than ASTM A394 shall be submitted to the Employer for approval.

Wrenches used during erection shall be well shaped and shall fit closely onto the hexagon to avoid damage to nut and bolt heads. The use of any wrench that may deform the nut or cut or flake the galvanizing will not be permitted.

During assembly, punching, reaming or drilling for correction of mismatched holes shall not be permitted without the authorization of Employer in writing.

All members shall have their joints cleaned when bolted up. As far as possible bolt heads, rather than nuts, shall be on the outer or upper faces of tower joints.

4.15.6 Mis-fabricated Members

If shop errors in the steel members are discovered, the Contractor shall notify the Employer who will decide whether the errors may be corrected in the field, or the members returned to the fabricator for correction or replacement at the Contractor’s expense.

No drifting will be allowed in assembling towers. Reaming for correction of mismatched holes due to shop errors will not be permitted.

Misalignment or misfit of adjacent sections or members attributable to the adopted method of erection shall be corrected by changing erection methods as necessary to eliminate the trouble.

4.15.7 Damaged Members

Members that are bent, twisted or otherwise deformed in storage, transportation, handling or erecting operations shall be straightened or replaced by the Contractor. Straightening shall be done only by the use of methods that will not damage the galvanized coating. The method of straightening shall be approved by the Employer. Tolerances for lateral variations of straightened members shall be as follows:

Table 9 - Tolerance for Members

Member type	Permitted lateral variation
Compression Members	+ 2:1000
Tension-only Members	+ 6:1000

4.15.8 Damaged Galvanizing

All galvanizing damage occurring as a result of transportation, handling, storage, repair operations, field drilling, installation or from bent/damaged members shall be repaired by the Contractor. The damaged area shall be cleaned by wiping with clean rags saturated with mineral spirits of Xylene followed by wire brushing.

After wire brushing, the area shall be re-cleaned with solvent to remove residue and shall be given a minimum of two coats of an approved galvanizing (zinc rich) repair paint. The amount of pure zinc by weight in dry film of the galvanizing repair paint shall not be less than 85%.

4.15.9 Tower Sign and Accessories

The Contractor shall install the tower sign plates and the anti-climbing devices on all towers. Aerial Number Plates shall be installed as specified on the drawing and as approved by the Employer.

4.16 Installation of Insulators and Fittings (OHL)

4.16.1 Insulators

Insulators and insulator fittings shall be assembled and installed by the Contractor as shown on the drawings, and in accordance with the recommendations of the manufacturers.

Insulators shall be packed in wooden crates and shall be delivered to the job sites in their original containers. All insulators and fittings shall remain stored in the original containers until required for installation.

All insulators shall be handled carefully during transportation, assembly and installation on the tower to avoid damage and shall be cleaned when installed using techniques which cause no damage to the surface of the insulator.

All insulators shall be inspected before their assembly in accordance with the required number to form the appropriate sets. The Contractor shall ensure that the insulating material, the caps and pins are free from any defects.

All damaged insulators shall be rejected, whatever damage it may be, and whether it is on the insulating material, the metal parts or the galvanized coating.

Proper precautions shall be taken to ensure that insulators and fittings are not strained or damaged during erection of the insulator sets, and during the pulling out and erection of conductors.

The Contractor shall take adequate precautions to ensure that dust and dirt is excluded from insulator ball and socket joints.

4.16.2 Suspension and Dead-End Accessories

Suspension and dead-end hardware for conductor, aluminium clad steel shield wire and OPGW shall be handled in such a manner that it shall not be broken, scratched or damaged.

All accessories shall be installed in the location and in the manner shown on the assembly drawings. All nuts, lock nuts, washers, cotter pins, etc., supplied with the accessories, shall be installed in the correct order and location. No substitutes or omission will be permitted without the specific approval of the Employer.

All accessories found to be incorrectly assembled or placed, shall be reassembled correctly or changed by the Contractor at his expense, and the Contractor shall be fully responsible for any damages resulting from incorrect installation.

4.16.3 Compression Dead-End Fittings and Joints for Conductors

Compression joints and dead-end fittings shall be installed in accordance with the manufacturer’s recommendation. The Contractor shall submit detailed written instructions for the complete installation procedure for the approval of the Employer.

The number and span location of tension joints shall be approved by the Employer.

Unless otherwise approved there shall be no tension joints in adjacent spans or in sections, between tension towers, of less than three spans. there shall be no joints in spans crossing roads, navigable waterways or buildings or in the spans immediately adjacent thereto. All joints shall be at least 30 m away from structures. The Contractor shall keep a record of all joints and tension clamps indicating the location, type and date of each assembly.

Cutting of layers of ACSR conductors shall be carried out with tools designed not to damage underlying strands. Cropping or shearing of complete conductors shall not be permitted. The cut ends of the conductors and the joints, clamps and fittings attached to the conductor themselves shall be treated in an approved manner to prevent ingress of moisture.

The Contractor shall measure by means of approved micro-ohm meter equipment, in accordance with the Tests section of this Technical Specification, the electrical resistance of all joints after completion and before erection. The resistance of the joint shall be in accordance with the requirements of the Specification and shall in no case be greater than 75 % of the resistance of the equivalent length of conductor. The values of resistance measured shall be recorded on a schedule that shall be submitted to Employer as part of the final records. Any faulty joint shall be cut out and replaced at the Contractor’s expense.

4.16.4 Compression Dead-End Fittings and Joints for Aluminium Clad Steel and Aluminium Conductor Steel Reinforced Shield Wires

Compression dead-end fittings and compression joints for aluminium-clad steel shield wire shall also be made in accordance with the requirements of Clause 23.3 of this Specification. The procedure to be followed shall be as recommended by the manufacturer.

There shall be no connecting joints on OPGW. Optical fibres shall only be jointed at approved joint boxes, in accordance with the requirements given in this Technical Specification.

4.16.5 Repair Sleeves

In case of local damage to isolated strands of a conductor during erection the use of repair sleeves of approved type may, in exceptional circumstances, be permitted upon application to and at the discretion of Employer who will regard repair sleeves as joints in respect of permitted locations. Any use of repair sleeves shall not incur additional cost to the Employer. Repair sleeves shall be installed with approved tools using methods recommended by the manufacturer.

4.16.6 Armour Rods

The provisions of the Specification in relation to armour rods shall also apply to armour rods for OPGW earth conductors (if applicable). In addition, the number of layers making up the armour rod for OPGW shall be in accordance with the recommendations of the supplier of the suspension clamp for OPGW and shall be to the approval of Employer. The armour rods shall be positioned centrally in the suspension clamp to a tolerance of 50 mm.

Contact surfaces shall be clean and free of injurious matter immediately prior to installation.

4.16.7 Vibration Dampers

Dampers shall be provided in each span and installed in accordance with the manufacturer’s recommendation. A vibration study to determine these damper placement positions shall be provided by the Contractor, or the damper supplier as part of the Contractor’ scope of works.

Alternative combinations of spacer dampers, with or without end-span Stockbridge dampers, may be adopted providing satisfactory performance data has been offered for the proposed system.

Before installation, all dampers shall be thoroughly cleaned and inspected for bent spring wires, distorted clamps or other damage.

4.16.8 Semi Flexible Spacer

All Semi Flexible Spacer units shall be installed in accordance with the instructions furnished by the manufacturer.

Installation may be done from mobile carts supported equally by all wires of the conductor bundle. Carts and all cart accessories, lines, etc. shall be furnished by the Contractor. The Contractor shall furnish for approval complete data, drawings and other descriptive information for the carts prior to their use, for approval by the Employer.

Semi Flexible Spacer shall be installed immediately after the clipping-in process of conductors has been completed.

4.17 Stringing of Conductor

4.17.1 General

All towers shall be permanently and effectively grounded, and the required ground resistance satisfied prior to commencement of stringing.

The Contractor shall string and sag the conductors conforming to IEEE 524, according to manufacturer's recommendations and in accordance with the drawings and specifications. Sub-conductors shall belong to a single matched set. They shall be pulled simultaneously by the use of one pulling line only. After sagging, the point of attachment shall be marked on each conductor in a manner satisfactory to the Employer. The insulator assemblies shall be attached to the conductors at the points marked on the conductors.

Care shall be taken during handling and storage to prevent abrasion or other damage to the conductors. Prior to installation, reels of conductor shall be stored, blocked-up off the ground and adequately supported so as to avoid damage to reel, lagging and conductor. Conductors and reels shall be kept free of standing water, dust and mud.

Lagging or other protective covering shall be removed at the job site and the outside layer of each reel shall be examined by the Contractor and Employer to ensure that the conductors are in good condition and that no nails, staples or other sharp objects, which would damage the conductors during unreeling, protrude on the inside of the reel heads. At no time shall the conductors be dragged over the ground or any other rough surface.

4.17.2 Stringing

Conductors shall be pulled out and strung by an approved tension stringing method. Conductors shall, as a principle, never be allowed to touch ground.

The Contractor shall submit in writing, for the approval of the Employer, a complete and detailed description of the stringing equipment and the stringing and sagging procedure intended for use.

At least three (3) months prior to the commencement of stringing activities the Contractor shall submit his stringing schedule identifying the stringing sections, locations of tensioner and puller, the proposed position of mid-span joints, drum identification numbers, sagging spans and, where appropriate, check sagging spans. The sagging span shall normally be the longest span within the section, but consideration shall be given to establishing a line-of-sight to the puller station. In addition, details of temporary staying of towers, joints of control and other relevant information shall be submitted.

The fullest use possible shall be made of the maximum lengths of line and earth conductor in order to reduce to a minimum the number of joints.

Unless otherwise approved by the Employer, the tension stringing procedure shall be in strict conformity with the recommendations of the manufacturer of the stringing equipment. Only specially trained linesmen who are well-acquainted with the handling and running of the particular equipment to be used must be employed.

Reliable means of instantaneous two-way communication must be available between the pulling and the braking crews, and between these crews and any observation posts that may be placed along the stringing section. For the safety of community members and bypassers, the Contractor shall assign personnel on every span of the section being strung.

The stringing equipment shall be set up so as not to cause excessive vertical loads on the towers. The distance to the nearest tower through which the cables are being strung shall be selected with due regard to the relative levels of the pulleys on the tower and the stringing equipment. A reasonable allowance should also be made for possible accidental over-tensioning of the cables.

The conductors, joints and clamps shall be assembled using the approved tools and shall be erected in such a manner that no bird-caging, over-tensioning of individual wires or layers, or other deformation or damage to the conductors shall occur.

Running out blocks shall be of an appropriate diameter to avoid the formation of permanent "sets" in the conductor and shall be to the approval of the Employer. The use of midspan compression joints for the purpose of pulling out conductors during erection and the use of insulators and line materials in general for erection purposes will not be allowed. Running out blocks shall be free running and of approved materials and dimensions, multi-sheave type for stringing two conductors simultaneously. These sheaves shall be equipped with high quality bearings with provisions for lubrication if applicable and shall have conductive neoprene or other suitable lining approved by the Employer. The Employer will retain the right to inspect and reject any stringing block which in its opinion is not functioning properly or otherwise might damage the conductor or adversely affect the conductor sag.

Running out blocks shall be inspected daily for proper operation. The use of defective pulleys will not be permitted.

At all times during stringing, the conductors shall be handled and protected so as not to be scratched, nicked, abraded, kinked or otherwise damaged. If during stringing it should prove inevitable to lower the conductors to the ground, suitable non-metallic lagging shall be placed underneath.

Conductors or conductor strands, which have been subject to bird-caging during stringing, will not be accepted.

Stringing tensions shall, at no times, exceed corresponding sagging tensions.

Clamps for attaching the conductors to the hauling device shall be of approved design and shall prevent relative movements of strand or layers of the conductors. Freely rotating ball bearing swivels shall be used for each cable to be strung.

Auxiliary erection clamps, or hauling devices shall be of approved design, and shall under erection conditions, allow no relative movement of strands or layers of the conductors. If required by Employer, this shall be demonstrated by actual test.

If, for any reason, stringing operations in progress must be interrupted, the conductors may be left in the stringing pulleys, but their tension shall be reduced as far as possible. In all cases, however, the conductors must be kept completely clear of the ground, by a minimum of 2 meters, and sufficiently far from any obstacles which might cause abrasion of the conductors, if touched by them.

If the interruption lasts for more than 40 hours, or if stormy weather has prevailed, the conductors shall be closely inspected for damage. Such inspection applies particularly to the suspension points where the conductors have been resting in the pulley sheaves.

At all times during stringing, sagging and clamping operations, the conductors, reels and hauling equipment shall be effectively earthed.

The Contractor shall at his own expense make suitable arrangements for temporary guying of towers, where necessary. Suitable plates (detachable or otherwise) shall be provided on the towers for the attachment of any temporary guys. The additional loads imposed on specific towers during erection by the use of temporary guys shall be calculated and approved by the Employer. Attachment of the guys to the tower shall be accomplished so as not to damage steelwork or the galvanized coating.

The Contractor shall make any necessary special arrangements for running out and sagging the conductors where the route crosses buildings, orchards, plantations, gardens, or other ground over which erection cannot be carried out in the normal manner. No extra charge for man-handling of material or for any special precautions or methods necessary at such positions shall be allowed.

The Contractor shall also make such special arrangements, as Employer may approve, where power lines are to be crossed. Where the conductors have to be erected whilst the power line to be crossed is energized, no additional payment to the prices stated in Price Schedules shall be made for any additional costs incurred for any special scaffolding, temporary works or equipment required.

At crossings of roads, buildings, waterways, telegraph and telephone lines, over or under other power lines, the provisions of any Regulations to which Employer is subject shall be complied with. No additional payment will be made for any temporary guarding or scaffolding required for erection of the conductors at crossings.

Prior to the stringing and erection of the conductors along or across power lines, telecommunication circuits, public roads, waterways or other authority owned or operated assets, the Contractor shall be responsible for giving advance notice, and gaining of any required permits or approvals, to and from the appropriate authorities at the specified date and time at which the Contractor proposes to carry out the work.

Where authorities or public undertakings deem it necessary for the protection of their employees or property, or of the public, or for the regulation of traffic, to provide flagmen or watchmen, the cost of such provision shall be borne by the Contractor.

Where required by Employer, prior to the issue of the taking-over certificate, the Contractor shall be responsible for checking that the relative sags of the conductors are within the specified tolerance. Such checks shall be carried out at selected points along the route as required by Employer.

The Contractor shall provide suitable dynamometers, thermometers, sighting rods and other approved apparatus necessary for the proper checking of the work.

Dynamometers, if used, shall read in kilograms or Newtons and, where required by Employer, shall be tested and, if required, recalibrated.

Clearances between phase conductors and ground. and between jumpers and structures shall be checked during erection and before handing over the line.

The Contractor shall submit his proposals for a test regime to Employer for approval prior to fieldwork commencing.

4.17.3 Sagging

The line and earth conductors shall be erected so that the tensions at “everyday temperature” in still air shall be the figures stated in the Technical Schedules and shall be equal in all spans, excepting for sections with spans differing considerably from the basic span where compliance with the specified tensions under the assumed maximum loading conditions may necessitate a lower figure for the “everyday temperature” still air tension. The line characteristics are vertical Double Circuit twin bundle configuration.

At “everyday temperature” in still air, in any span, the earth conductor sag shall be approximately 10% less than the line conductor sag.

In calculating the initial sags and tensions allowance shall be made for creep, the elasticity and coefficient of expansion of the conductor materials.

Unless otherwise approved, the sag of any one conductor should not differ from the correct sag by more than 3% and, in any one span, the maximum permissible difference in sag between conductors of different phases shall not exceed 150 mm.

Employing the approved design sags and tensions as the basis the Contractor shall submit, for approval, calculations for the initial sags and tensions to be employed during stringing activities. These calculations shall take into consideration the effects of creep for each of the phase and earth conductors and also that, for instance, Aircraft Warning Markers will not be installed at the time of sagging. For sections where Aircraft Warning Markers are to be installed additional initial sag and tension data shall be provided.

The Contractor shall submit, for the approval of the Employer, sag and tension charts for use during erection, which shall be established with due regard to the specific stringing and sagging methods to be employed so that remaining creep after clamping may be assessed and considered with reasonable accuracy.

Erection sagging charts or tables shall display sag in still air against span length for temperatures between 0°C and 50°C in increments of 2°C.

Sagging temperature shall be read from a certified thermometer, the bulb of which has been inserted in an approximately 50 cm long piece of conductor with the inner layers removed. The thermometer so equipped shall be freely suspended in the air without any shielding and not less than 3 m above ground. Temperature readings will be taken only after 20 minutes’ exposure.

After finishing stringing operations, the conductors shall be sagged in accordance with agreed sagging procedure and relevant erection sagging chart or table. It is essential that prescribed hold periods before final sagging are rigorously observed and adhered to.

The Contractor shall check the sag of each conductor of a sagging section in at least one span of approximate average length. The sags shall also be checked in all spans exceeding 450m and in spans on each side of angle structures and sharp breaks in profile. Intermediate spans shall be inspected for uniform sag.

If the Employer wishes to check the sag at any locations, the Contractor shall furnish such assistance in equipment and personnel as may be required for this purpose.

Sagging sections shall be limited to such length as can be sagged satisfactorily but shall not be in excess of 15 spans or 5.5 km, whichever is less.

Work shall be planned so that cables can be pulled and sagged as specified within a 24-hours period.

Conductor tension shall be equalized between sagging sections so that the insulator strings will assume the proper position when successive sagging sections have been clamped in.

The Contractor shall keep a record on approved schedules of the particulars of the sagging of conductors on each stringing section.

Sag Template

The Contractor shall provide three complete sets of sag templates on Perspex or similar material based on a maximum for each construction of three equivalent spans that encompass the range of spans encountered. The spans selected shall be to approval.

The templates shall show the line conductor sag in still air at the maximum temperature of line conductor specified in the Technical Schedules and the ground clearance line. An additional curve shall be marked on the template showing the conductor sag at minimum temperature in still air condition. Each template shall be clearly endorsed with the design loading conditions, type of conductor, basis of calculations, equivalent span and the scale appropriate to the scale of the relevant profile. The templates shall include a vertical scale showing the heights of the conductor attachment on the standard and extended towers.

The scales of the sag templates shall be 1:200 vertically and 1:2000 horizontally or other approved scales to match those used for the profile.

4.17.4 Clipping

After finishing the sagging operations, the conductors shall be clamped-in according to agreed procedure. Tension clamps shall be installed and properly anchored prior to clamping-in at suspension strings. In order to make future adjustments possible, approximately one half of the available length adjustment of sag adjusters shall remain after anchoring.

Clamping-in shall be affected within 48 hours after completion of sagging, unless otherwise agreed but conductors shall hang in the running out blocks for a minimum of two (2) hours before the clipping operation is started.

In transferring the cables from the stringing pulley to the suspension clamps and during installation of the preformed armour rods, the cables shall be carried by neoprene lined hooks with a saddle-shaped bearing surface long enough so as not to damage the cables or any part thereof, or by equivalent means, as agreed with the Employer. The neoprene lining shall be electrically conductive.

Armour rods shall be installed in strict accordance with the manufacturer's instruction. They shall be centred within plus or minus 50 mm. When installed, the difference between the ends of the rods shall not exceed 5 mm.

All marking of the cables, e.g. for the centring of clamps or armour rods, shall be done with tape or by other damage-free methods. Scratch marks or similar will not be permitted.

Tightening torque of clamp bolts shall be as recommended by the manufacturer.

Immediately after clamping-in, sag tolerances shall be plus or minus 3% of specified sag, provided that specified clearance to ground will be obtained. The sag of a sub-conductor may not vary over one wire diameter from the other conductors in the same bundle.

Suspension insulators shall be plumbed longitudinally within plus or minus 30 mm over the full insulator set length.

4.17.5 Communications

The Contractor shall maintain good communications between personnel at the tensioner end, the puller end and intermediate points at all times during stringing operations. Running boards shall be observed as they pass through each traveller. The running board observers shall have reliable communications with both pulling and tensioning ends. Dual systems of communication shall be available during stringing in case one system fails.

4.18 Stringing of Aluminium-Clad Steel and Aluminium Conductor Steel Reinforced 95/55 Shield Wire

4.18.1 General

This specification sets out installation parameters which are specific to shield wire. These are additional to the requirements of Clause 4.17 of this Specification.

Care shall be taken to avoid damaging the shield wire during handling and stringing operations.

4.18.2 Stringing

See stringing of phase conductor within this Specification, section 4.17 above.

Shield wire shall be strung for the entire length of the transmission line.

Tools and equipment used for installing the shield wire shall be similar to those specified for the conductor. Stringing plans for shield wire shall be included in the stringing plans for the conductors.

Shield wire shall be strung in advance of the conductors. The method of stringing shall be the same as specified for conductors. The tools and equipment for stringing of shield wire shall be earthed in accordance with that for conductors. The same degree of care in handling conductors shall be exercised to avoid damage to the shield wire. Damaged wire shall be replaced by the Contractor to the satisfaction of the Employer.

4.18.3 Sagging

The shield wire shall be sagged in place before sagging of the conductors and shall be in accordance with the sag and tension tables for the shield wire to be supplied by the Contractor.

Sagging of the shield wire shall follow the requirements specified for conductor.

4.18.4 Clipping In

After being sagged, the shield wire shall be clipped in the same manner as specified for the conductor.

4.19 Stringing of Optical Ground Wire (OPGW)

4.19.1 General

This specification sets out installation parameters which are specific to OPGW. These are additional to the requirements of 4.17 above.

Care shall be taken to avoid damaging the OPGW during handling and stringing operations. The Contractor shall avoid sharp bends to the cable and take precautions to prevent crushing the OPGW during placement. To avoid degradation of the transmission quality of the optical fibres, the Contractor shall not subject the OPGW to excessive pulling tensions or excessively small bend diameters.

OPGW cable reels shall always be transported and handled in an upright position. Reels of OPGW cable shall not be laid on its side.

4.19.2 Stringing

OPGW shall be pulled out and strung, before any conductor, by an approved tension stringing method. The Contractor shall submit in writing, for the approval of the Employer, a complete and detailed description of the stringing equipment and the stringing and sagging procedure intended for use. This procedure shall be approved by the OPGW’s manufacturer.

The erection of OPGW is to be affected in such a manner that neither torsion nor bending stresses on the conductor during erection, sagging, jointing or landing shall cause any damage or deterioration to the optical fibre system. Suitable precautions shall be taken, using for example: torsional stable pulling ropes, suitable running-boards, counterweights and running blocks. Special attention shall be paid to ensure that the OPGW at no time is subjected to bending in excess of that permitted by the minimum bending radius specified by the manufacturer. Running-out blocks shall be sized to conform to the minimum bending radius specified by the OPGW manufacturer.

The Contractor shall make sure that:

- The pulling line shall have the same direction lay as the OPGW to help resist the tendency to rotate under stringing load.
- The stringing block shall have neoprene lined grooves.
- The tensioner and puller shall be positioned at a 3:1 ratio to the stringing block on the first structure adjacent to the equipment.
- An anti-torsion device shall be installed between the OPGW and the pulling line.
- The OPGW shall not be cut with ratchet cutters or other type of tools which could crush the aluminium pipe.
- The following values shall be followed in order to prevent damage to the OPGW:
 - Minimum Bull Wheel Diameter 70 x D (OPGW).
 - Recommended Block Diameter 40 x D (OPGW).
 - Permanent Bend Radius (no tension) 15 x D (OPGW).
 - Maximum Stringing Tension 20% of the OPGW Rated Breaking Strength.

The Contractor shall carry out tests to confirm the satisfactory condition of optical fibres prior to erection.

Once installation of OPGW earth conductor is complete a series of tests to be agreed with Employer shall be carried out to ensure the satisfactory operation of the cable. The tests shall be carried out in both directions.

- On completion of the tests, three (3) copies of the test report shall be supplied to Employer.
- Optical attenuation of the OPGW earth conductor terminated with connectors shall be measured and recorded at the end of the guarantee period and it shall not be more than 102% of the reading at commissioning.

The Contractor shall submit his proposals for erection and test regimes to the Employer for approval prior to fieldwork commencing.

4.19.3 Sagging

The Contractor shall submit for approval the sag and tension data provided by the OPGW’s manufacturer.

A temporary grip shall be installed on the OPGW for tensioning. The grip shall be designed to hold the OPGW without damage, and in particular not pinch the cable or crush the aluminium pipe.

4.19.4 Dead-Ending and Clipping-in

Dead-ends shall be installed on OPGW spans which terminate at splicing towers or ends of the system including on suspension towers when required. Dead-ends shall also be used at angle structures when angles are too great to use suspension clamps. Suspension clamps are normally used at the remaining towers.

The OPGW shall not be allowed to lay in the stringing blocks for more than 48 hours after being sagged.

To lift the OPGW from the stringing blocks in order to install the hardware, come-alongs or pre-formed wire grips shall be attached on both sides of the block and a coffin hoist shall be placed over the tower arm. The hooks of the coffin hoist shall be attached to the come-alongs and jacked up to form a small loop in the OPGW. The block shall then be removed, and the armour rods can be placed on the OPGW then attached to the structure.

Vibration dampers shall be placed on the OPGW immediately after clipping in.

4.20 Towers for sensitive areas like the Euphorbia critical habitat.

The Contractor shall design, survey, install, and erect all transmission line components per international standards and the Employer's Requirements. All engineering activities shall comply with ESHS obligations, particularly for sensitive areas like the Euphorbia critical habitat.

4.20.1 Tower Design

Towers shall be designed to withstand specified loads with a safety factor of 1.5.

- **Material and Footprint:**
 - High-strength steel (S355 per EN 10025) with hot-dip galvanizing (min 85µm per IEC 1461). Pile foundations to avoid shallow root disturbance and high-impact foundation solutions (e.g., wider flat foundation).
 - All foundation works must avoid mapped outcrops and comply with the buffer zones established by the E&S specialists.
- **Design Submission:** Detailed drawings, including load calculations and foundation plans, shall be submitted timely and at least according to the time schedule in the contract submitted by the contractor for Employer approval. Designs shall be validated via PLS-CADD software, with output shared.

4.20.2 Survey and Setting Out

Pre-construction surveys should use advanced techniques to ensure accuracy and environmental compliance.

- **General Survey:** Conduct topographic surveys using Leica GS18T GNSS (RTK ±1cm accuracy) or equivalent and a drone for the entire line route, with data submitted in GIS format within 45 days.
- **Euphorbia Area Survey:** For the critical habitat, use high-resolution LIDAR (50 points/m²) and GPS to map Euphorbia outcrops within a 100m buffer. No-go zones shall be marked with physical stakes and GPS coordinates, coordinated with NHCC. Survey report due 30 days prior to construction start, validated by an independent ecologist.

4.20.3 Installation and Erection

- **Euphorbia Area Erection:** All construction activities within the sensitive Euphorbia area (including delivery of materials, excavation, assembly, and erection) must be performed manually, without the use of heavy machinery or vehicles, unless specifically approved by the Employer and E&S specialists. The Contractor is mandated manual erection using rope access techniques (e.g., industrial climbers certified to IRATA Level 3) and hand tools, and prohibited using heavy machinery within the 100m buffer. Towers shall be pre-assembled off-site and lifted in sections to minimize disturbance. A construction crane on the tower can be used, but all parts of this crane should be manually transported to tower sites and assembled without using heavy machinery equipment. If there will be no impact or risk for the critical habitat created by downforce wind, helicopter airlifting of equipment (such as excavators, drill rigs, tower components, insulator strings, and hardware) can be used.
- **Stringing:** If a stringing machine(s) is placed near the sensitive area, the Contractor shall use very low noise and vibration type stringing/tensioning equipment for 800m spans, with sag/tension monitored via theodolite (accuracy ±0.1%). Conductors (ACSR Bison) shall be pulled at <50% rated strength to avoid habitat stress. If these machines and/or equipment are placed far away from the sensitive area, noise and vibration are normal level.
- **Safety and Monitoring:** Implement fall arrest systems and temporary earthing per IEEE 516. An ecologist shall oversee erection, with daily logs submitted.
- **Special tools:** Special tools required for manual erection should comply with Technical Schedule Section 8.12 Special Tools for Euphorbia Critical Habitat.

5 CLEARING OF RIGHT OF WAY (R.O.W.)

Clearing shall consist of the removal and disposal of trees and other vegetation, houses and huts, barns, cattle-sheds, etc. within a total width of 60 m, i.e. 30 m on each side of the centre of the 400kV transmission line, and 50 m, i.e. 25 m on each side of the centre of the 330kV and 132kV transmission lines. The Contractor shall not remove any type of construction or man-made artefact from the R.O.W. without the Employer's authorisation.

The transmission line wayleave (ROW) should also be demarcated by installation of reinforced concrete markers after every 100m both sides of the wayleave. The reinforced concrete markers shall be of dimensions: height = 2.5 meters (1.5m buried and 1m above ground), width = 0.3 x 0.3m and marked at the top with "ZESCO".

All tall trees within a 3.0m falling distance of the conductors shall be removed even if they are outside the 60m/50m cleared band after obtaining the necessary permission from the Employer.

Anthills shall be smoothly levelled off, wherever they may cause ground clearance problems. This will not attract an extra charge to the Employer.

No clearing under the transmission line is required for trees, crops and other vegetation of commercial value with:

- A maximum mature height above the ground of not more than 2 m if within the 60m/50m corridor of the transmission line.
- Trees outside of the wayleave who are of such height that if it falls, the tree risk to damage a conductor or a tower, these trees shall be removed.
- Trees and bushes shall be cut down to a height of not more than 0.5 m above ground level and not removed by bulldozer.

The destruction of annual food crops and plantations shall be reduced to a minimum by cutting one meter (1m) only of the width of the centre line for survey and one meter (1m) of the 3 phases of conductor corridors (approximately 3m) in farmlands for pulling conductor pilot wires. Any clearing in excess of these strips in farmlands shall be done only with the written permission of the Employer and should be carried out post-harvest of the food crop or other crop if possible.

At tower sites, all trees, brush or other vegetation within an area equal to the dimensions of the tower base between legs plus 2m on each side shall be cleared by the Contractor as close to the ground as possible. Stumps on the tower site area shall not project more than 100 mm above ground level.

All cleared material shall be left piled in windrows, burned or disposed as directed by the Employer. Brush piles, log piles or windrows of material shall be located at a sufficient distance from the tower sites so that succeeding construction operations are in no way hindered.

In addition, the location of cleared material which may be burned shall in no way endanger standing timber, salvaged logs, crops or other items of property either on or off the right-of way.

Burning of cleared material shall be done only with the written authorization of the Employer. The Contractor shall ensure that this operation will not harm human and animal lives, while complying with environmental safety measure. The Contractor shall be responsible for the ignition, control and extinction of all fires for the purpose of burning cleared material.

The Contractor shall be responsible for any damages incurred due to burning of cleared material. Salvaged logs may be used by the Contractor in construction operations, turned over to the former property owner or disposed of by the Contractor on or off the site of the work as directed by the Employer.

6 ACCESS ROADS

6.1 General

The construction of access roads shall, whenever possible, lie within the transmission line R.O.W. and be as close as possible to the towers.

The Contractor shall obtain from local land-owners and the agencies involved, all necessary access permits as well as those required for the construction of the transmission line within the R.O.W. defined above. If problems arise, the Contractor shall endeavour to amicably resolve them with the parties involved.

The Contractor shall provide his own construction roads, required for clearing and construction purposes, complete with all related culverts, trenches and other stream or obstacle crossing facilities. During construction, roads and tracks used jointly with the land-owners must remain usable at all times. All openings made through fences or walls of private properties must be equipped with locking doors or gates accessible to both Contractor and local land-owners, if both use them.

The Contractor shall construct one common access road along the transmission line, and also branching roads at suitable locations to connect between the access road and main roads.

After obtaining preliminary approval from the Employer, the Contractor shall, at an early stage of the Contract, arrange all proposed points and routes of access with landowners or other interested parties, and thereafter prepare access maps for final agreement and approval of the Employer.

6.2 Site Condition

Where new access/maintenance roads tie into existing roads, the Contractor shall visit the existing access/maintenance roads and familiarize himself with the required modifications and/or condition. The Contractor shall verify the condition and location of all existing access/maintenance roads before construction and re-instate these to a condition at least as good as at the commencement of the works.

6.3 Methodology and Design Requirements

The Contractor shall submit for Employer’s review relevant plans and details showing the sequence and methods to construct the Transmission Line access/maintenance roads. The plan shall include the equipment to be used, access routes relative to existing routes and detailed design of the interfaces between existing roads and the access/maintenance roads.

The access and maintenance roads shall be designed to withstand environmental conditions.

Temporary roads shall also be designed for environmental conditions for the duration of the transmission line construction, with consideration given to its stability and maintenance thereafter.

All temporary and permanent access roads shall be constructed in areas where there is no possibility of landslides or slope erosion, otherwise the Contractor shall provide permanent slope protection and preventative measures for land erosion such that the roads would remain fully operational.

Access and maintenance roads shall have a gravel wearing course of a depth of at least 200 mm as directed by the Employer. Bidders are expected to provide a unit rate for providing a gravelling for the access road. If instructed by the Employer, the Contractor may be required to undertake the works as per the unit rates provided in Price Schedules.

6.4 Execution

The Contractor shall avoid excessive cutting and clearing of trees and wild vegetation in the vicinity of the access/maintenance roads for the purpose of slope stability and erosion due to water from heavy rain falls, or otherwise.

The construction of temporary lay down or storage areas shall be subject to the Employer’s approval.

The surface of all access or maintenance roads shall be cleared and all loose, soft, disturbed and unsuitable materials, debris, ponded water, organic and other deleterious or unsuitable material shall be removed.

All access/maintenance roads shall be approved by the Employer in writing.

All access/maintenance roads shall include provisions for drainage of water due to heavy rain falls in tropical climates and those specified in this document.

The water drainage system shall be approved by the Employer.

7 REMEASURED WORK

All measurements of length for the purpose of payments shall be to the nearest metre (m), and shall be made, after erection, along the centre line of the transmission line without allowance for sag or slope.

All measurements of mass for the purpose of payments shall be to the nearest kilogram (kg), and shall be calculated from the approved working drawings, steel being assumed to have a density of 7850 kg/m³.

All measurement of the cleared strip shall be based on the prices stated in Price Schedules which shall be deemed to be the average for the total line route irrespective of the varying density of the vegetation or the nature of the terrain.

All measurements for the purpose of payments shall be made jointly by representatives of the Contractor and the Employer/Engineer.

The rates given for the standard types of towers, standard foundations, earthing, excavation, concrete, steelwork and reinforcement for foundations of special towers shall include all work which the Contractor may have to do when installing the standard towers, foundations, special foundations and earthing, regardless of the nature of the ground, the presence of water, the slope or irregularity of the ground surface or other local conditions, except that where sloping ground necessitates the use of individual tower leg extensions, these extensions will be paid for at the appropriate rates given in Price Schedules. Additional work that may be required to secure foundations against the effects of soil erosion will be paid at scheduled rates.

The rates for modified standard foundations shall be made up from the rates in Price Schedules or shall be otherwise approved.

Single leg extensions for standard, extended and special towers shall be paid for at the rate stated in the Price Schedules.

Payment for minor modifications to parts of standard towers which do not involve modifications to the main structure, such as modifications to crossarms, etc. shall be calculated by deducting from the price of the standard tower the cost of the omitted steelwork calculated at 75 % of the special steelwork rate stated in Price Schedules and adding the cost of the modified steelwork calculated at the whole of that special steelwork rate. Steelwork additional to an otherwise standard tower, such as additional brackets, etc shall be paid for at the special steelwork rate stated in Price Schedules. Where a standard tower is erected on special foundations, or on a special extension, the standard tower shall be paid for at the rate stated in Price Schedules and the special extension and the foundations shall be paid for at the appropriate rates stated in Price Schedules. Special towers, or standard towers with radical modifications to the main structure, and the special foundations shall be paid for at the appropriate rates stated in Price Schedules.

Where specialist soil investigation (not routine soil investigation as detailed and included in the price schedules) required for specialist foundation work including design and construction is carried out by an approved subcontractor, this shall be paid for at agreed cost plus 5 %.

8 DRAWINGS, DOCUMENTATION AND SAMPLES

8.1 Drawings and documentation

All drawings shall be to scale and comply in full of the Technical Specification and be fully detailed.

The Contractor shall submit samples of materials as required from time to time by the Employer.

All final As-Built drawings and documents must be provided in PDF and original software formats.

The Contractor shall submit all drawings or samples of materials for review in sufficient time to permit modifications to be made and the drawings or samples resubmitted without delaying the initial deliveries or the completion of the Contract Works.

If the Contractor shall require review of any drawing within four (4) weeks of its submission in order to avoid delay in the completion of the Contract Works, he shall advise the Employer to such effect when submitting the drawing.

The number of copies of each drawing or of any subsequent revision to be submitted to the Employer is given below. Following review, further copies of the reviewed drawing shall be supplied to the Employer for distribution to Employer and to Site.

Drawings for review shall be submitted electronically in a commonly used format and as paper prints and shall bear the authorized Contract reference.

All drawings shall be drawn to one of the preferred scales quoted in Section 7 of BS Publication PD6031 or available on a standard ruler and on paper of the appropriate size from the International Series of A sizes.

All detail drawings submitted for review shall be to scale and of a size not less than 1/25 full size. All the important dimensions shall be given, and the material of which each part is to be constructed shall be indicated.

Except as otherwise specifically approved, all drawings shall be of size not greater than A0 (normally 841 mm x 1189 mm) not smaller than A4 (normally 210 mm x 297 mm). All prints shall be folded to A4 size and the title, drawing number and revision suffix shall remain visible.

All dimensions marked on the drawings shall be considered correct although measurement by scale may differ there from. Detailed drawings shall be acted on where they differ from general arrangement drawings.

The Employer reserves the right to request any further additional information that may be considered necessary in order fully to review the Contractor’s drawings.

Any drawing modified from a previously submitted drawing shall bear a new version number. Revised drawings reissued for review shall have at least one copy clearly marked indicating the amendments to the drawing. Revision boxes must be provided giving the date, revision letter and brief description of each drawing.

Any drawing or document submitted for information only shall be indicated as such by the Contractor. Drawings submitted for information only will not be returned to the Contractor unless the Employer considers that such drawings do need to be reviewed, in which case they will be returned suitably stamped with comments.

All drawings submitted by the Contractor shall include the following particulars in a suitable format: Contractor’s name, date, scale, number and title of the drawing, contract number, and overhead line title and equipment description.

The Contractor shall when submitting drawings provide an indexing system for all the drawings divided for each type of equipment.

The drawing format and the indexing system will be agreed at the first Contract meeting between the Contractor and the Employer.

Drawings, samples and models already submitted by the Contractor and reviewed by the Employer (and such drawings, samples and models as shall be thereafter submitted by the Contractor and reviewed by the Employer) shall not be departed from without the instruction in writing of the Employer.

All drawings, samples and models shall be submitted in accordance with the provisions in the Schedules and shall become the property of Employer.

Minimum number of copies of each drawing/calculation/documentation or of any subsequent revision to be submitted to the Employer is given below:

	Prints	Electronic Copy by E-mail (see Note 1)	Electronic Copy - on USB media
For approval			
Calculations and drawings		2	
Other design documents		2	
Method statements		2	
Commissioning procedures		2	
For construction			
Calculations and drawings	3	2	
Other design documents	3	2	
Method Statements	3	2	
Commissioning procedures	3	2	
Final records			
Calculations and drawings	3	2	4

	Prints	Electronic Copy by E-mail (see Note 1)	Electronic Copy - on USB media
Other design documents	3	2	4
Method Statements	3	2	4
Commissioning procedures	3	2	4

Note 1: For documents to be provided by email, the quantity given in the table is the number of independent emails required.

8.2 Submittals to be attached to the Bid

8.2.1 Overhead Line Submittals

8.2.1.1 Drawings

The following are the drawings to be submitted with the Bid:

- a. Tower outlines with clearance diagrams for all the tower types listed in the Technical Data Sheets. Each tower outline drawing shall show a route for the step bolts, position of anti-climbing guard, bird guards and notice plates for all standard towers and extensions.
- b. Diagram of external loads:
 - i. Suspension towers
 - ii. Tension towers
- c. General arrangement of:
 - i. Suspension insulator sets and fittings
 - ii. Tension insulator sets and fittings
- d. Detailed drawings of:
 - i. Insulator unit
 - ii. Line conductor tension anchor clamp and midspan joint
 - iii. Line conductor suspension clamp
 - iv. Cross-section of the complete OPGW, the design and make-up of the cable.
 - v. Earth conductor tension clamps and midspan joints
 - vi. Earth conductor suspension clamps
 - vii. Line conductor non-tension joint
 - viii. Line conductor vibration damper
 - ix. Earth conductor vibration dampers
- e. Foundation outlines for all standard designs.

8.2.1.2 Documentation

The following is a list of documentation to be submitted with the Bid.

- a. Programme of anticipated works, to conform with completion times required in the Special Conditions of Contract.
- b. Details of the method of working to demonstrate that the specified Quality Assurance requirements will be complied with.
- c. Copies of any standards proposed in substitution for International Electro-technical Commission Standards or Recommendations or British Standards accompanied where necessary by English translations of the appropriate sections.
- d. Record of previous service experience of the fibre-optic earth wire offered.
- e. Documentary evidence of the successful service history of the proposed damping system for line and earth conductors in environments at least as hostile as that for the present project.
- f. Documentary evidence of satisfactory service history of the glass insulators.
- g. Other supporting documentation considered appropriate by the Bidder.

8.3 Submittals during contract period

8.3.1 Programme of submittals

The Contractor shall arrange his design and drawing programme so that the works can be properly co-ordinated by the Employer. He shall provide the documentation as specified below within four (4) weeks of the award of Contract, together with any drawings and information considered necessary by the Contractor or Employer.

- a. Confirmation of contract documentation
- b. A detailed schedule of all plant to be supplied under the Contract. This schedule shall have space for the following information as a minimum requirement in respect of each item:
 - i. Manufacturer
 - ii. Country of origin
 - iii. Planned FOB delivery date
 - iv. Planned date of arrival on site
 - v. Sub-order number (as applicable)
 - vi. Allocated drawing numbers
- c. A preliminary schedule of drawings to be submitted to the Employer for approval in respect of all items of equipment to be supplied under the Contract. The schedule shall include a programme for submittal of all drawings required by the Specification.
The schedule shall have space for at least the following information to be added at a later date:
 - i. Drawing number
 - ii. Drawing title
 - iii. Proposed date of submission

- iv. Actual date of submission
- v. Resubmissions
- vi. Revision numbers
- vii. Date of approval
- viii. Release as a working drawing
- ix. Date to site
- x. Date to Employer
- xi. Date of as-built drawing

8.3.2 Drawing numbers

The Contractor will apply drawing numbers to all drawings, including those from sub-Contractors and those issued for information before they are submitted to the Employer. The Contractor’s drawing office will be expected to issue the numbers in batches that will cover broad subject areas. For instance, the Contractor might propose batches for towers, foundations, insulators, conductors, profiles, etc. The Contractor shall submit to the Employer for approval the subject areas he proposes to use prior to the issue of any drawing. The Contractor shall each month issue an up-to-date drawing list to the Employer.

8.3.3 Overhead Line Drawings & Records

8.3.3.1 Drawings to be submitted during the contract period

- a. Design drawings and documents detailing:
 - i. Calculations giving the design basis to be employed for the sags and tensions for the line and earth conductors for both final and erection conditions and calculations providing data for the manufacture of the sag templates.
 - ii. Derivation of applied loads for all towers including wind on structure.
 - iii. Detailed live metal or wire clearance diagrams for each type of tower.
 - iv. Basis to be employed for the design of structures.
 - v. Analysis of maximum member and connection loads and capacities for all members in standard towers, body and leg extensions.
 - vi. Structure foundation loads for all loading cases demonstrating that the critical condition for any combination of body and leg extension has been considered.
 - vii. Foundation designs for all standard classes, including stub and cleat designs.
 - viii. Concrete mix design.
- b. Arrangement drawings of:
 - i. Each type of standard tower, body and leg extension showing connection to foundations, insulator and earth conductor attachments and complete with all necessary erection information and part list including weight.
 - ii. Stubs, foundations (including details of reinforcement, excavation, stub setting).
 - iii. Special towers, extensions and foundations (as required).
- c. Detail drawings of:
 - i. Suspension and tension insulator sets, with all fittings and securing devices.
 - ii. Insulator units, showing cross section and details of securing device.
 - iii. Line conductor tension clamps and joints.
 - iv. Tension make-offs and suspension clamps for earth conductors.
 - v. Vibration dampers for line and earth conductors including calculations to demonstrate the efficacy of the proposed system.
 - vi. All OPGW ancillary equipment.
 - vii. Tower earthing arrangements.
 - viii. **Aircraft warning spheres** and marking.
 - ix. Proposed live-line maintenance equipment.
 - x. Danger and property, route and tower number, circuit colour, phase and aerial number plates.
 - xi. Curves showing the initial and final sags and tensions of the line and earth conductors at different spans and temperatures, all in accordance with the Specification.
 - xii. Route plans, schedules and profile drawings all in accordance with the Specification.

8.3.3.2 Specific required Contractor’s Records

Throughout the progress of all transmission line Works, the Contractor shall maintain the Following technical documents and records in format approved by the Employer which will facilitate their respective incorporation into the operation and maintenance manuals described:

- A comprehensive structure list which provides the final structure numbers, final as-constructed tower types, tower body, and leg extensions, foundation types, spans, tower foundation earthing arrangement/type and the recorded earth resistance for each tower site, all road, rail, crossing details including crossing of major bodies of water as appropriate, identification of key access points and any other relevant as-built information.
- Included with this structure list shall be an approved table summarizing all pertinent data relating to the line design and construction, including but not limited to conductor and insulator types, manufacture and specifications, lists of Drawings relating to the line, foundation types and their selection criteria, tower foundation earthing details and keys for all abbreviations used in the structure list.
- All Plan and Profile sheets shall be suitably completed and corrected to show as-constructed tower and foundation types, tower extensions, final tower numbers, amended span lengths and ruling span lengths, shield wire and conductor maximum temperature curves and any other relevant data normally presented on profile sheets.
- Detailed foundation records shall include depth and details of the foundation, soil description, penetrometer reading or other soil test data, depth to water table and any special measures required to strengthen the base of the hole, details of anticorrosion precautions and details of any imported backfill. Details of tower foundation earthing and final tower foundation earth resistance measurement shall also be given.
- A complete set of stringing and sagging records sheets shall be kept. These sheets shall show the ruling span, control span, check spans, sagging spans and details of temperature and actual observed sag.
- A complete set of records indicating the location of midspan tension joints and showing the phase conductor or shield wire concerned and the ohmic resistance recorded for each respective joint.
- A complete set of transmission line software design packages for the tower design and profiles.

8.3.3.3 Final Records

The list of drawings required for final record purposes is given below:

- Tower and foundation designs and calculations
- Tower and foundation details including all types of extensions
- Insulator sets plus component parts
- Earth conductor suspension and tension sets plus component parts
- All types of connectors, dampers and joints
- Earthing details
- Line conductor and earth conductor initial/final sag-tension charts
- Wire clearance diagrams
- Material lists for each tower
- Stub setting templates
- Foundation installation details
- Foundation setting level diagrams
- Profiles and strip plans
- Route maps
- Line schedules
- Tower footing resistance chart
- Tower notice plates and accessories.

8.3.4 Final Records - General Requirements

After completion of work on Site all Contract drawings shall be revised where necessary to show the equipment as installed and the number of copies of revised drawings as specified in this Section shall be submitted for review. A complete set of reviewed records shall be provided comprising, one full size reproducible copy and one full size print. Record drawings shall be endorsed “**As Built**” and shall be correctly titled and carry the Employer’s review number, Contractor’s drawing number and where appropriate Employer’s number allocated to the item, all above subject to Employers / Owner’s Engineers final review.

After final review of the “**As Built**” record drawings the Contractor shall submit complete sets of records on **USB media**, one of which is for Employer as detailed in Part 2. Electronic copies of the drawings shall be in electronic format suitable for reproduction on paper using Employer’s preferred software packages. Each USB media shall provide a comprehensive drawing list containing the drawing number, sheet, revision and title of every drawing. Each single file drawing record shall be self-supporting without referencing other files. Non-standard items such as fonts, line types, etc. should not be used. If compression techniques are applied to files, then any software necessary to decompress the files shall be included on the discs. The Contractor shall ensure that all information contained on the discs has been checked for virus contamination. Each USB media shall be supplied suitably encased and accompanied with printed documentation describing the contents of the USB media, the formats and software used to compile the discs, and the print hardware required to reproduce the record drawings.

Final record copies shall be handed over before the issue of the Taking Over Certificate.

8.3.5 Installation and Maintenance Instructions

The Contract Price shall be deemed to include illustrated installation and maintenance instructions written in English.

Before commencement of conductor stringing the Contractor shall submit to the Employer for review fully detailed operating and maintenance instructions for compressors and any other working equipment. Also, to be included are instructions on the method of making compression joints and the methods to be used for the erection of all fittings on the line together with the necessary tests and checks to ensure fitting has been successfully performed. The instructions are to be as simple and clear as possible, fully illustrated with drawings and diagrams as necessary and detailed with part numbers for ordering of replacements. Two (2) copies are required for use of the Employer during erection work.

Further copies are to be reproduced as a book or books of approximately A4 size and bound into strong black durable imitation leather covers inscribed upon the front generally in the form of the title page to this document except that the references to Specification, Conditions of Contract, drawings, etc, will be replaced by “Installation and Maintenance Instructions”. The name of Employer shall be inscribed upon the spine.

Drawings to be delivered and bound in A3 size (or larger) where applicable, as well as on USB media.

The finished books are to be handed to the Employer not later than one (1) month before the Taking-Over Certificate is issued. The same information shall also be delivered in pdf format.

9 CLEAN-UP, FINAL INSPECTION AND TESTING

9.1 General

Completion of the transmission line work shall be followed immediately by a clean-up and a final inspection, including outstanding remedial work, the repair of damages and testing in accordance with the Project Specifications.

9.2 Clean-Up

The Contractor shall remove from the vicinity of the work, all plant, construction equipment, rubbish, concrete forms and other like materials. Unused materials shall be disposed of in accordance with the C-ESMP, as approved by the Project Manager.

The Contractor shall restore:

- All irrigation and water infrastructure facilities to the condition existing before arrival on site,
- Natural drainage in areas where temporary facilities have been made for construction purposes,
- Any fences, gates, etc., which have been damaged during construction,
- Access roads to their original condition, including community roads affected by the project.

9.3 Final Inspection

The Contractor shall carry out a final inspection of the completed work in the presence of the Employer prior to tests or completion.

During this inspection, the Contractor shall remedy all defects immediately, and in particular, ensure the following:

- Backfilling of the excavations, levelling around foundations, drainage requirements for footings on sloping ground, disposal of excess earth, etc. have been completed.
- Concrete protruding above ground is correctly shaped, finished and sealed, Counterpoise earthing is installed where required.
- Towers are true to line and are vertically acceptable.
- Tower accessories, signs, anti-climbing devices, etc. are complete and correctly fitted.
- Tower framework is free of all foreign matter.
- Scratches or like damage to galvanizing has been carefully repaired to the Employer’s approval.
- Insulators are free from conspicuous foreign material, and all units are undamaged.
- Conductor, aluminium-clad steel shield wire and OPGW fittings have been erected in accordance with the drawings and are complete, splices are at the correct span locations and line conductor, aluminium-clad steel shield wires and OPGW are correctly clamped, and all jumpers correctly installed. OPGW joint boxes correctly installed.
- All conductor stringing pulleys, temporary earths hooks, and other equipment has been removed from the line.
- All bolts, nuts and cotter pins, washers and split pins on all fittings are properly fitted, tightened and locked. Maximum protrusion of bolt shall be no more than 15mm over the edge of the nut and minimum engagement of bolt shall be not less than 4 threads over the edge of the nut.
- Silicone, epoxy or other approved painting has been correctly applied. Steel sections are straight and not damaged.
- Conductors, aluminium-clad steel shield wire and OPGW are clean, without strand damage and free of foliage, loose wires, etc. The sag of all cables are in accordance with sagging documents and clearances are correct. Vibration damper quantities and positions are correct and installed correctly.
- Access roads and feeder roads have been properly completed.
- Right of way is clear from trees or buildings encroachment.
- Grounding connections are properly in place.
- Transposition towers and their configuration are correct and at specified locations.

9.4 Tests on Completion

The Contractor shall arrange and carry out all tests to demonstrate that the transmission line is completed and ready to operate. The Contractor shall proceed to regular commissioning tests such as checking the behaviour of insulators, insulation, loss of charge, etc., using the appropriate equipment.

The Contractor shall measure, among other things, the line’s electric parameters such as insulation, resistance to AC and DC current, the line phase-to-phase, phase-to-ground reactance and impedance, etc. as requested by and to the satisfaction of the Employer.

The field testing on completed OPGW and optical connections is specified in relevant sections.

Qualified personnel shall be present during the testing when the line is to be energized so that they can give assistance and carry out any corrective measures with respect to the performance of the transmission line.

All tests shall be carried out in the presence of the Employer, and the Contractor shall provide the necessary labour, transport, apparatus, instruments and other assistance as required by the Employer.

9.5 Warranty

The Warranty supplied for the works shall be for a two (2) year period from Operational Acceptance and receipt of hand-over certificate. The Contractor shall warrant that all the Goods are new and unused and that they incorporate all recent improvement in design and materials, unless provided otherwise in the Contract.

The Employer shall give notice to the Contractor stating the nature of any such defects together with all available evidence thereof, promptly following the discovery thereof. The Employer shall afford all reasonable opportunity for the Contractor to inspect such defects. The Warranty on the Conductors, Insulators, and Fittings shall remain valid for a two (2) year after the goods, or any portion thereof as the case may be, have been accepted for operation, and hand-over certificate received.

Upon receipt of such notice, the Contractor shall, within the warranty period expeditiously repair or replace the defective goods or parts thereof, at no cost to the Employer.

If having been notified, the Supplier fails to remedy the defect within the warranty period specified the Purchaser may proceed to take within a reasonable period such remedial action as may be necessary, at the Contractor’s risk and expense and without prejudice to any other rights which the Purchaser may have against the Supplier under the Contract.

10 SCHEDULE OF GUARANTEED TECHNICAL CHARACTERISTICS**10.1 Instructions To Bidders**

The Technical Data Schedules form an integral part of the Tender Specifications and shall be filled in as follows:

- The Bidder/Contractor will be bound to comply with the requirements stated in these Technical Data Schedules as well as those stated in the Technical Specifications.
- Only the “Guaranteed” column of the following pages must be filled in by the bidder completely. The schedules shall not be changed or modified in any way.
- Each item called for in Technical Data Schedules must be type-written. If a particular item is not applicable or not quoted, the letters NA (Not Applicable) or NQ (Not Quoted) shall be typed in the space provided. For any data missing from the Technical Data Schedules, the most unfavourable data proposed by any competitor will be assumed for evaluation purposes.
- Deviations to specifications shall be explained separately.
- The expression “or equivalent” for manufacturer’s names is unacceptable and will be disregarded.
- Catalogues and further descriptive information on all equipment quoted and the pertinent data shall be submitted sufficiently in such a way that the Project Manager shall have full and complete knowledge of the system and equipment offered. This information shall be summarized on suitably arranged sheets and attached to these Technical Schedules.
- Bidders are required to fill in and sign the attached Schedules of Guaranteed Technical Characteristics for each type of equipment and attach one copy of each with their bids. Information given on these schedules shall be binding. Quotations on items for which the subject schedule is not duly filled and submitted in attachment to the bid shall not be considered. Missing data or information may entitle the Employer to reject the bid.

The Technical Data Schedules are attached in Section VII, Appendix 1.

10.2 Soil Investigations

Refer to sections 3.13.2 and 3.13.3 above for Geotechnical Investigations requirements

Item	Particulars	Unit	Minimum Requirements	Guaranteed Particulars
11.3.1	Penetration equipment in accordance with the characteristic data as specified in the Technical Requirements, Soil Investigations. If other types, specify characteristic data.	type	SPT or DPL or CPT or other	

11 TESTING AND INSPECTION

11.1 General

Introduction

This section contains general requirements for inspections and tests of material, parts, equipment and workmanship of the plant during manufacture, assembling and erection and upon completion to demonstrate compliance with General Technical Requirements/Particular Technical Requirements, codes and standards to ensure overall reliability of plant operation and performance.

The Employer, the Employer's Representative and/or authorized agents shall, at all reasonable times, be allowed free and ready access to the Contractor's premises and those of his suppliers for the purpose of inspecting the specified equipment components and obtaining information as to the progress of the work. Failure on the part of the Employer / Employer's Representative, at this or any other time, to discover or reject materials or work which do not meet specified requirements shall not be deemed an acceptance thereof nor a waiver of defects therein.

The approval of the Employer / Employer's Representative will not prejudice the right of the Employer to reject equipment if it does not give complete satisfaction in service.

The tests listed in the appropriate sections of these technical requirements are the minimum

requirements. The Contractor shall, at the appropriate time, prove that his material and/or equipment comply with all the requirements of this section, such proof being the successful completion of tests and inspections.

Scope, Program, Documentation

All main components and equipment offered for and supplied under this Contract shall be type tested. The Bidder shall enclose in his Bid Type Test Certificates separately for each such main component and equipment offered. Such Type Test Certificates shall be issued by internationally recognized testing organizations for type tests carried out on components and equipment which are, in the opinion of the Employer / Employer's Representative, of identical type or identical in all essential respects to the equipment offered. If any of the Type Tests Certificates submitted is not applicable to the component or equipment offered, the Employer / Employer's Representative reserves the right to require re-testing or the inclusion of additional tests in the routine test program.

The Bidder shall enclose in his Bid the reports for all type tests and additional type tests certificates as per technical specification along with equipment / material drawings separately for each such main component and equipment offered. The type tests conducted earlier should have been conducted in accredited laboratory based on ISO / IEC Guide 25 / 17025 and the test reports submitted shall be of the tests conducted within last 7 (seven) years prior to the date of bid opening (unless specially agreed with the purchaser). In case the test reports are of the test conducted earlier than 8(eight) years prior to the date of bid opening, the Bidder shall repeat these test(s) at no extra cost to the Employer. In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design / manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification or any/all additional type tests not carried out, same shall be carried out without any additional cost implication to the Employer.

In case any Bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected.

The Bidder shall intimate the Employer the detailed program about the tests at least 8 (eight) weeks in advance.

During manufacture, erection and after completion all materials, components and equipment supplied as well as works performed under this Contract may be subjected to inspection by the Employer / Employer's Representative, should they so require. The works may also be subjected to inspection and tests by any approved agencies of insurance or inspection companies, approved by the Employer, in accordance with the requirements of these technical requirements.

Quality assurance

The Contractor shall provide and operate a quality assurance system both in his facilities and the facilities of his Subcontractors and at site capable of producing objective evidence that the material and equipment meet the quality requirements of the technical requirements. The system shall be in accordance with ISO 9001.

The Contractor shall include an outline inspection plan in his Bid. Before delivery a detailed inspection plan shall be submitted to the Employer/Employer's Representative for approval. It shall describe the facilities and site inspection for each major component and for the finally assembled equipment and shall include the following:

- A schedule or flow chart indicating each inspection and the stages in the manufacturing and erection process where the Contractor proposes inspection shall be carried out.
- A short-written description of the method for each inspection
- Standards of acceptance, with references to International Standards or Codes where applicable. Where the Contractor's acceptance standards are proposed, copies of such standards shall be provided.

The Contractor has primary responsibility for ensuring the quality of items of equipment supplied under the Contract and remains accountable when manufacture or erection is subcontracted. It is therefore a requirement of the technical requirements that works are only

subcontracted to companies with effective Quality Assurance (QA) organization and that the Contractor monitors the quality control by the attendance at tests of experienced inspectors employed by the Contractor.

Adequate notice shall be given when the equipment is ready for inspection or test and every facility shall be provided by the Contractor and his Subcontractors to enable the Employer/Employer's Representative to carry out the necessary inspection of the plant.

A detailed record of the results of all tests and inspection shall be maintained by the Contractor and copies provided to the Employer/Employer's Representative within a reasonable time after the tests.

Facilities for inspections and tests

The tests shall be performed to the agreed inspection and test plan using acceptance criteria approved by the Employer/Employer's Representative.

The Contractor shall provide all the test equipment and test sets required for carrying out the inspection and tests. Equipment provided for testing at site shall remain the property of the Employer.

All equipment shall have current calibration certification.

Factory Acceptance Tests (FAT)

Extensive Factory Acceptance Testing (FAT) shall be conducted on material and equipment incorporated in the works to verify that the equipment, material and parts have been manufactured to meet the requirement of technical specifications and that the various systems and assemblies as a whole function as specified.

Successful factory tests release the parts, material, systems and equipment for shipment. Factory test acceptance and shipment release shall not be granted in case there are major shortcomings in quality, functions or performance, or a large amount of smaller deficiencies. Instead, the Contractor shall be required to correct the system at factory, and thereafter re-do the relevant factory tests.

The Employer shall attend the Factory Acceptance Tests, as specified in the Scope of Supply.

The Contractor shall submit for approval the proposed Inspection and Test Plan at least two (2) months before the pre-FAT or FAT.

The Inspection and Test Plan shall define the following:

- Test Program (time schedule)
- Test Procedures (approval criteria; record forms; test instruments)
- Test Specifications After successful completion of FAT, the Contractor shall submit the completed and signed FAT records, in category “For Information”, if the tests have been witnessed by the Employer’s representative, otherwise “For Approval”. Subsequently, upon receipt, or approval, of the FAT records, the Employer shall prepare the Acceptance Certificate / Shipping Release (COA) for the concerned FAT material and convey the COA to the Contractor. A separate COA shall be prepared for each FAT shipment. No shipment of goods shall take place without relevant Acceptance Certificate / Shipping Release Certificate

Test methods shall be based on IEC recommendations and standards. The Bidder shall state the applied standards and test methods. A tentative test program and a test procedure shall be supplied before each individual test. The test procedure shall specify in detail the tests to be performed, based on the specified requirements. Detailed documentation (e.g. circuit diagrams, flow charts) of the tested system / equipment shall also be available to the Employer / Employer's Representative at the same time. For-mats of the test report which are intended to be used shall be submitted for approval together with test program.

The Contractor shall duly consider provisions specified in the Bidding Document Documents as mini-mum requirements when preparing the inspection and test plan with respect to type and extent of inspection and tests, to location, orientation and number of test samples, to frequency and amount of taking samples for statistical quality control and with respect to acceptance criteria for all QA measures.

The Employer / Employer's Representative will return a copy of the Contractor's proposed inspection program indicating those inspection stages for which notification is required. Notification shall be by e-mail and shall be sent at least 20 days prior to the intended test. If the Employer and/or the Employer's Representative intends to be present at the test he will provide at least 24 hours' notice and if his representative does not attend on the notified date the test may proceed unless an alternative date has been requested by the Employer / Employer's Representative.

Within thirty (30) calendar days of completion of each and every test copies of all test records, test certificates and performance curves shall be supplied for all tests carried out in accordance with the provision of the contract, whether or not the Employer / Employer's Representative has witnessed them. Information given on such test certificates and curves shall be sufficient to identify the equipment and software to which the certificates refer and shall also bear the Contractors' reference and heading.

The test reports shall indicate the tests performed, contract references, the results obtained, instruments used, names of test personnel, and provide for witnesses' signatures. They shall also be numbered and dated.

Rejection of Elements

Any item of plant or component which fails to comply with the requirements of these technical

requirements in any respect at whatever stage of manufacture, test, erection or on completion at site may be rejected by the Employer / Employer's Representative either in whole or part as he considers necessary.

After adjustment or modification if so directed by the Employer / Employer's Representative; the Contractor shall submit the item for further inspection and/or tests. Plant or components with defects of such a nature that the requirements of the technical requirements cannot be met by adjustment or modification shall be replaced by the Contractor at his own expense and to the satisfaction of the Employer / Employer's Representative.

Codes and Standards

All equipment shall be inspected and tested in accordance with the requirements of the relevant standards and codes and the present technical requirements.

The type and extent of inspection shall generally be in accordance with that specified in the standard used for design and construction of the item of equipment supplemented or amended by the requirements of this section of the technical requirements.

Additional design tests are also to be carried out as described in the other parts of this technical requirements.

Reference to special codes and standards, where designated either directly or as "relevant", is intended to provide a measure of performance, safety, in-shop and on-site testing, and methods of construction and/or installation which must be equalled or exceeded in order to be considered acceptable for use under these technical requirements. If more than a single degree of quality or accuracy is permitted within the scope of particular code or standard, the highest quality shall be applicable and the degree of accuracy commensurate with the intended function shall be selected but with the understanding in either case that the decision as to degree will be made finally along with procedures by the Employer / Employer's Representative.

In all instances, the finally accepted applicable code or standard shall be the version last published prior to the date of submission of the Bid selected as the basis for this Contract.

Where no appropriate standard is available, tests shall be carried out in accordance with the

Manufacturer's standard practice, which needs the approval of the Employer / Employer's Representative. In such cases the Contractor shall submit to the Employer / Employer's Representative complete data and a suggested procedure for the testing to be performed before manufacture commences. If the proposed procedure is accepted, the Contractor shall provide the Employer / Employer's Representative with four additional copies in English before any test is performed.

The Contractor's attention is drawn to the climatic conditions in the site area. De-rating factors are to be in accordance with the relevant IEC codes and standards or an approved equivalent

Services Prior to and During Inspections and Tests

In accordance with and in addition to agreed standards, the Contractor shall submit procedures for material testing, manufacture, quality control and performance testing as they apply from the procurement phase of raw materials to the finished product.

No inspection will be made or deemed valid unless the Employer / Employer's Representative's head offices, the Contractor and Sub-supplier are in possession of all relevant approved drawings and procedures for the item to be tested.

The Contractor on request shall supply the Employer with a copy of drawings and procedures at the time of the test.

All instruments and apparatus required for the inspection or used for the performance of tests shall be calibrated to an agreed standard at a laboratory of national standing. The cost of making such calibrations shall be borne by the Contractor in all cases.

Quality Control of Materials

General

Materials shall be manufactured and tested in accordance with the specified standards and testing pro-grams approved by the Employer / Employer's Representative. If no standards are specified the equipment shall be tested in accordance with the relevant IEC regulations.

All materials shall be suitably identified and traceable to supporting test certification.

Material supplier's certificates of compliance will be acceptable for minor items only at the discretion of the Employer / Employer's Representative.

Employer / Employer's representative shall provide a Field Quality Control Plan for effective control on quality of civil works. All costs of testing as per approved Field Quality Control Plan or as directed shall be borne by the Bidder.

Materials for earthing and lightning protection

The materials for the installation of earthing equipment and lightning protection shall be tested in accordance with the relevant IEC regulations.

Workshop Assembly

In addition to the quality and production control tests, the following shop assembly work and tests shall be made to check measurements, fitting and functioning.

Equipment to be furnished shall be shop assembled to a status sufficient to prove that the design and workmanship have been executed in accordance with the technical requirements, that the delivery is complete, and that no work remains to be done at site which reasonably may or should be done in the workshop.

Where applicable, each item of the equipment shall be assembled completely prior to delivery.

Field joints shall be temporarily connected.

All parts shall be properly match marked, identified and doweled to ensure and, where practicable, to facilitate correct and quick field assembly.

If the assembly shows defects in the design or manufacture or unforeseen difficulties in assembling and dismantling, these must be eliminated. If required, design alterations or corrective machining may be executed provided that no sacrifice with respect to reliability of operation or interchangeability is made and provided that the agreement of the Employer / Employer's Representative has been obtained.

If the corrections cannot be carried out in accordance with the terms mentioned above, the components concerned would be rejected. The decision on possible subsequent corrections is reserved exclusively to the Employer / Employer's Representative. Faulted equipment parts shall not be delivered.

Welding and Surface Coating Tests

Welding

For all major structural welded items the Contractor shall submit the following documented proposals prior to commencement of welding:

- welding procedure specifications with qualification records;
- post weld heat treatment procedures where applicable;
- inspection schedule including quality requirements
- non-destructive testing procedures;
- standard weld repair procedures.

All welders employed on items of plant for this Contract shall be qualified.

All welds shall be visually examined and shall be of smooth contour, free from cracks, undercuts and other significant defects. Welds shall be non-destructively tested in accordance with the construction standard applicable to the item of plant. Where appropriate, the magnetic particle testing or the ultra-sonic examination is to be applied.

Galvanized zinc coatings

Surfaces shall be visually inspected. Bare patches, lumps blisters or inclusions of foreign matter shall be cause for rejection.

Zinc coating thickness shall be determined non-destructively in accordance with DIN EN ISO 2178 or coulometrically in accordance with DIN EN ISO 2177 or an equivalent standard.

Inspections and Tests During Manufacture

General

As far as practicable, quality of materials, workmanship and performance of all items of the equipment furnished under the present contract shall be inspected at the places of manufacture by the Contractor's QA inspectors.

Equipment shall wherever practical be subject to tests on completion in the Manufacturer's work to prove that the reliability, operation and performance conform to the requirements of these technical requirements and the provisions of the appropriate standards.

All facilities shall be provided by the Contractor to enable the Employer and to carry out the necessary inspection of the equipment components and the costs of all tests during manufacture and preparation of test records are to be borne by the Contractor.

The Contractor shall submit for approval procedures describing the proposed test methods to be used. Type and layout of test facility, location of instrumentation, formula for calculation of results and correction to site conditions, etc. shall be included where appropriate.

All measuring instruments used in tests shall be regularly calibrated at the expense of the Contractor and records shall be available for examinations by the Employer / Employer's Representative.

The passing of the inspection or test will not, however, prejudice the right of the Employer / Employer's Representative to reject the equipment components if they do not comply with the technical requirements when erected, or give complete satisfaction in service. Where the Contractor desires to use stock material, not manufactured specially for the work, satisfactory evidence that such material conforms to the requirements of the contract shall be submitted. In this case tests on these materials may be waived, but certificates are to be submitted.

Arrangements shall be made for expediting the shop inspection by having all shop assemblies or pieces covering a single shipment ready at one time. Any packing work as well as transport to the site of the equipment concerned shall not be started before the approval of the Employer / Employer's Representative has been obtained and all QA certificates due at this time for the equipment concerned have been received and reviewed by the Employer / Employer's Representative.

Transmission Line Equipment

a) Conductor and ground wire tests

The conductors and ground wires shall be subjected to the sample tests at the Sub-suppliers' workshop or in authorized laboratories according to standards IEC 61089, IEC 60888, IEC 60889, BS EN 50182:

As a minimum, the following tests shall be carried out

1-for wires

- diameter ,
- conductivity
- tensile breaking strength
- wrapping
- tensile stress at 1% elongation for steel wires
- galvanizing for steel wires

2-for the complete conductor

- appearance and finish
- constancy of shape
- overall diameter
- stranding and lay ratio
- quantity of wires
- tensile breaking strength
- weight

3-for grease

- grease weight per metro
- dropping point

Tests of dampers

Vibration dampers for conductors and earth wires shall be subjected to tests according to IEC 61897.

The type tests of the vibration dampers refer to:

- dynamic characteristic test;
- fatigue test;
- clamp slip test;
- torque test.

Dynamic characteristic test

This test is intended to establish the dynamic characteristics of the dampers.

The damper shall be vertically mounted on a shaker table and driven with a constant table velocity of both 0.10 m/s and 0.05 m/s. The frequency range shall be calculated.

The reaction force and the phase angle between the reaction force and the velocity shall be measured and power and impedance shall be plotted against the frequency over the given frequency range.

One half width value of the resonant peaks of the power curves provides good information about damping capabilities of a damper. This value shall be calculated for each resonant peak of the power curves. The values shall not be smaller than 0.3.

Fatigue test

This test is intended to demonstrate that the dampers have an acceptable fatigue limit.

The damper shall be attached to a shaker and driven in a vertical direction for 100 million cycles. The frequency range shall be calculated as in "Dynamic characteristic test".

After the fatigue test a new dynamic characteristic test shall be performed. There shall be no significant difference in the dynamic characteristics before and after the fatigue test.

Clamp slip test

This test is intended to verify the clamp slip force.

The damper clamp shall be installed on the conductor using the following torque:

- 45 Nm for M10;
- 60 Nm for M12 or bigger threads. _

Then a force shall be applied to the clamp along the axis of the conductor. The minimum force required to cause the clamp to slip on the conductor shall be recorded.

Torque test

This test is intended to demonstrate that the dampers fulfil the requirements as per Manufacturer's proposal and Employer / Employer's Representative s approval.

The clamp shall be attached to a section of the conductor. There shall be no failure of component parts.

In addition to the type tests shown above, corona and radio interference tests have to be carried out.

The sample tests of the vibration dampers refer to:

- verification of dimensions;
- check of dynamic characteristic (see type tests);
- check of clamp slip (see type tests);
- galvanizing.

The sample tests shall be carried out to the Employer / Employer's Representative 's requirements on an agreed basis.

No routine tests are required.

c) Tests of insulators and insulator sets

The insulator units and the insulator sets used in this Contract will be subjected to type, sample and routine tests according to IEC 60383 and EN 50341.

In addition, the following tests shall be carried out as type tests:

- radio interference tests, according to IEC 60437;
- artificial pollution tests, if applicable, according to IEC 60507;
- thermo-mechanical performance, according to IEC 60575.

For the sampling rules and acceptance criteria the IEC Publication 60591 is also to be considered.

The type tests (group 1) refer to:

a1 - dry lightning impulse withstand voltage

b1 - wet switching impulse withstand voltage

c1 - wet power frequency withstand voltage

For the insulator units, only the tests under a1 and c1 have to be applied.

In addition to the type test shown above, the overall dimensions of the insulator sets, as designed and approved by the Employer / Employer's Representative, shall be verified.

The sample tests (group 2) refer to:

a2 - verification of the locking system

b2 - verification of dimensions

c2 - temperature cycle test

d2 - electro-mechanical failing load test

e2 - mechanical failing load test

f2 - thermal shock test (glass only)

g2 - puncture test

h2 - porosity test (porcelain only)

i2 - galvanizing test

For the insulator sets only the tests under a2, b2 and e2 are to be applied.

The routine tests (group 3) which refer to:

a3 - visual examination

b3 - mechanical routine test

c3 - electrical routine test

d3 - thermal shock routine test (glass only)

have to be applied only to the insulator units.

The performance requirements shall be in accordance with the relevant EN and IEC regulations.

The tests referring to the insulator sets have to be carried out on completely equipped sets, with all clamp and fitting parts, installed in their characteristic working position and having attached also an agreed length of conductor.

The tests shall be carried out only in approved testing laboratories, according to IEC recommendations and other regulations.

d) Tests of clamps, fittings and accessories

The line clamps and fittings used in the insulator and earth wire attachment to tower sets as well as for the conductor and earth wire assembling will be subjected to type, sample and routine tests according to IEC 61284, IEC 61854, IEC 61467, or equivalent test standards, as agreed with the Employer / Employer's Representative.

From time to time the Employer / Employer's Representative may ask for further tests as required to ensure that the quality of the product is being maintained throughout the Contract.

e) Tests of transmission towers

The towers and tower members will be subjected to design and routine tests.

Design tests

The tests shall be executed in accordance with IEC Publication 60652 "Loading tests on overhead towers". The tests shall be carried out at the sub-supplier's workshop or at another approved place. Two test categories shall be applied:

- Tests to ultimate design loads
- Tests to destruction by applying the specified overload factors and, if applicable, by applying even higher loads up to destruction.

The height of the towers to be tested shall be the tower with body extension and with leg extension as approved by the Employer / Employer's Representative.

The tests shall be carried out for all specified loading assumptions (load cases) which are decisive for rating of tower members.

Steel towers submitted for test shall be galvanized.

If the Contractor, in carrying out erection of supports on site, proposes to assemble the supports on the ground and subsequently raise them to the vertical position, the sample tower submitted for tests shall be so assembled and raised to the vertical position on the test foundation in the presence of the Employer / Employer's Representative.

Each tower shall then be subject to such test loads in such order as the Employer and/or Employer's Representative may specify to prove compliance with the factors of safety. Loads for 100% load step shall be maintained for five minutes, during which time there shall be no slacking off or adjustments of loads.

Should it become necessary to adjust the loading, the 5 minute period shall start after the loading is stabilized and constant. All test loads shall be removed completely before the loads for the next test are applied, unless previously agreed to by the Employer. All test loads shall be applied directly to the regular attachment details provided for these loads. The applied loads shall be measured right in front of the tower loading points and the reading of all measured loads shall be enabled at one central place.

Any conspicuous yielding or any failure under any of the test loading or the use of an incorrect grade of steel shall be considered a defect. If a failure occurs, the Contractor shall correct the defect and repeat the loading test at his own expense, including any additional costs by the Employer and/or Employer's Representative for witnessing of the repeated test.

Test samples shall be cut from members which fail in the destruction tests and from those members judged to be critical from the design calculations, and standard tensile tests shall be performed at the Contractor's expense. Results of the tests on these samples shall be used to correct the assembled tower test results for comparison with the design.

Any tower or part thereof which has been overloaded during destruction tests shall not be used subsequently in the construction of the lines.

Where tower tests to nominal design loads are satisfactorily completed, the corresponding towers shall be carefully inspected after dismantling to ensure that no parts have been damaged and shall be marked for use in the permanent works at positions to be indicated by the Employer / Employer's Representative. A complete set of new bolts and nuts shall be supplied in such cases and their cost shall be deemed to be covered by the Contract Price.

The Contractor shall furnish all test structures, complete testing facilities, as may be required and shall perform all work herein specified, or implied. All items not specifically mentioned shall be deemed incidental to testing.

Routine tests

Samples of the material for the towers - standard or procedure - shall be tested in accordance with the relevant standards, recommendations and codes of practice.

The Employer / Employer's Representative will inspect also as soon as available at the Contractor's works the first consignment of complete foundation steelworks and stub setting templates.

To maintain fabrication standards, the Employer / Employer's Representative may call for repeated erection checks of any tower type during the manufacturing period at no extra cost.

Inspections and Tests During Erection and Commissioning

General

The Contractor's scope of delivery includes all site test and inspection expenses, e.g. all labour, materials, water, electricity, consumables, chemicals and stores as well as the instruments and apparatus as may be required to perform such tests efficiently. The Contractor is responsible for and shall include in his delivery all safety measures such as barriers, warning signs etc. required for inspection and testing while erection is in progress and all interruption of work in this connection will be at his expense.

All instruments and apparatus used for site inspection and testing shall be calibrated to an agreed standard at a laboratory of an international standing to be nominated by the Contractor. The cost of making such calibrations shall be borne by the Contractor in all cases.

During the erection of all mechanical, electrical, control, monitoring and telecommunication equipment the Contractor shall make the plant item available at any reasonable time for inspection by the Employer / Employer's Representative, should so require.

To assist the Employer / Employer's Representatives in their review of the quality of the work being performed, the Contractor shall provide the Employer / Employer's Representative with a schedule of the specific areas and items of work that will be performed during each work week. The list shall be presented to the Employer / Employer's Representative prior to the start of work on a day agreed by the Employer / Employer's Representative.

All work that is executed prior to such notification shall be done at the Contractor's own risk and may, at the Employer / Employer's Representative's request, be subject to removal and replacement by the Contractor at his expense.

In particular the Contractor has to mark on his implementation schedule all stages of erection or commissioning which are subject to the Employer / Employer's Representative's acceptance and has to notify one week in advance when such acceptance becomes due. The stages subject to acceptance shall include but not be limited to the items indicated in the technical requirements.

Before energizing certain checks need to be carried out. For start-up the Contractor will propose a program to be approved by the Employer / Employer's Representative. The program should give a step by step guide for the start-up taking into account, but not limited to, the checking of each disconnect, circuit breaker, circuit identification, current, voltage and power indication, phase rotation and correct phasing (this start-up shall also include all the substation auxiliary supplies and air ventilation).

Prior to placing each unit into commercial operation, commissioning tests shall be performed on the plant. These tests will be coordinated by the Employer but the Contractor shall assume full responsibility for the testing operation and safety of plant within his scope of work.

The Contractor shall cooperate with the Employer and with the other Contractors to permit all necessary tests to be performed.

The Contractor shall provide all necessary instruments to perform the tests on plant within his scope of work. The test instruments shall be new, of a current model and type, and with the precision required to conduct the specified tests. The Contractor shall follow operating procedures agreed by the Employer.

Copies of all log sheets and test readings shall be given to the Employer as the tests proceed.

After the conclusion of the tests, the Contractor shall compile a comprehensive test report to the approval of the Employer. This report shall include copies of all log and calculation sheets and all necessary tables and curves to record the results of the tests.

Transmission Line Equipment

The following checks and tests measurements shall be made unless otherwise specified in these technical requirements (as appropriate) in accordance with agreed standards and testing program:

Checks before start erection

- Check of completeness of delivery
- Check whether ratings are according to technical requirements

Check and tests on completion

After final erection the following checks shall be performed:

- visual check on equipment damage
- visual check of correct and neat installation
- check of critical minimal clearance distances
- check of bolt tightening
- check of completeness of earthing connections
- measurement of earth resistance
- check of correct phasing of transformer
- check of correct installation of instruction plates and safety signs

a) Tower earthing resistance

The tower earthing resistance shall be measured during initial installation and immediately before commissioning, but at least once during the dry season under reasonably dry soil conditions.

The measurements are to be carried out by means of a high frequency earth resistance measuring instrument, according to EN 50341 or equivalent standard, in order to allow readings of the impulse resistance value of the earthing system connected or not connected to tower and by towers having earth wires installed or not.

The measurements have to be clearly recorded. The schedules used for the recordings shall contain in addition to the measured ohmic values, details of the surface soil and underground data at the time of tests as well as the soil resistivity values.

If, in the opinion of the Employer / Employer's Representative, it is necessary to reduce the tower earthing resistance by approved means such as the installation of earth rods or counterpoise, the Contractor shall make further tests after the additional measures have been carried out at no extra charge.

b) Conductor and earth wire joints and clamps

The electrical resistance of at least 10 (ten) completed clamps, joints and terminal fittings of each type shall be accurately measured by the Contractor in the presence of the Employer / Employer's Representative. Should one clamp fail the test, another lot of 5 (five) clamps shall be tested.

Where the joint consists of several parts bolted together (e.g. dead end clamp with bolted-on jumper terminal) the resistance to be measured is that of the complete assembly. The resistance of any such fittings shall not exceed 75% of the resistance of an equivalent length of conductor, measured adjacent to the fittings, and the current carrying capacity shall be at least equal to that of the conductor.

The Contractor shall provide suitable equipment (such as the Chance Digital Micro Ohmmeter) in order to perform the above tests and shall submit details of the proposed instruments to the Employer / Employer's Representative for approval. Suitable clamps shall also be supplied for connecting the current leads of the measuring instrument to the test sample to provide adequate surface contact at the inter-faces. Test probes as used for potential contacts are unsuitable for current connections. Stringing of conductor and earth wire shall not commence until the instruments are on site and ready for use.

The centre mark on the steel inner sleeve of joint shall be checked by the Employer / Employer's Representative before completing the outer sleeve jointing. Details of the method shall be approved by the Employer / Employer's Representative.

The contact behavior of the conductor and earth wire joints and terminals shall be tested according to DIN VDE 0212 Part 52 A1 (type tests) or equivalent standard.

c) Fibre-optic cable field acceptance test

The Contractor shall perform field acceptance test and document the results of the installed cable to verify the cable's performance as required by these technical requirements. The Contractor shall notify the Employer and the Employer's Representative in advance so that

the Employer and the Employer's Representative can witness these tests. If the cable does not pass the field acceptance test, the Contractor shall replace the cable at the Contractor's expense with cable that does meet these technical requirements.

Attenuation per distance / uniformity

The Contractor shall measure the attenuation-vs-distance and attenuation uniformity of the fibres while the cable is on the reel as well as of the installed cable using an Optical-Time-Domain-Reflectometer (OTDR). Measurements will be made at 1550 nm. The attenuation of the fibre-optic cable shall not exceed the requirements in these technical requirements.

Attenuation with bending

The Contractor shall perform attenuation with bending tests using a 260 mm diameter mandrel on the cable and a 75 mm and 25 mm mandrel on selected individual fibres. The attenuation due to bending shall not exceed the requirements in these specifications.

Tensile strength of cable

The Contractor shall extract a sample length of cable from each reel and subject it to a pulling tension of 550 kg force and inspect for cable damage due to stress. The Contractor shall measure before, during, and after the test pull. The attenuation increase due to tensile stress shall not exceed the requirements in these specifications.

Fibre-optic equipment field acceptance test

Operational tests shall be carried out in order to demonstrate correct system operation also in conjunction with other parts of the telecommunication system.

The Contractor shall be responsible for the correct test procedures and testing shall be done in the presence of the Employer / Employer's Representative.

The tests shall include but not be limited to the following:

- check of optical continuity of the transmission path
- measurement of bit error rate
- measurement of jitter performance
- measurement of laser and receiver characteristics
- measurement of transmission times for protection and control signals
- individual checks of each transmitted signal
- check of safety measures (e.g. laser shutdown) and alarm systems (including alarm processing in the TMS and monitoring & SCADA system)
- measurements of optical parameters (attenuation, chromatic dispersion) shall be performed for each fibre on the completely installed sections of the transmission path.

The results of these measurements shall be stored in a database for comparing them with subsequent check measurements.

Documentation has not been met; the Contractor shall locate and correct all equipment faults, which have caused this shortfall in specified availability.

d) White rust

If evidence of white rust is apparent upon receipt at site of bundled steel sections, the Employer / Employer's Representative shall order the Contractor to make such tests as he deems necessary to determine the extent of damage, if any, and the remedial measures necessary.

e) Final erection checks

Not later than 90 days before finishing the erection of the first line section the Contractor shall prepare and submit for approval the erection check documentation.

The erection check documentation shall include check sheets for all transmission and ground wire components for each line section.

Immediately after finishing the erection of complete line sections final erection checks shall be performed. The final erection checks shall be conducted by the Contractor with the attendance of the Employer's Representative or the Employer.

The results of the final erection checks shall be recorded in the check sheets including the deficiencies to be rectified and shall be signed by the parties attending the checks. The deficiencies shall be rectified before energizing and in coordination with the requirements of the Employer.

Site Acceptance Tests (SAT)

SAT shall be conducted after installation but before energization to verify on-site integrity. Tests shall account for site-specific conditions (e.g., altitude variations per the line route map, pollution classes).

- Line Integrity Checks: Visual inspections for damage, sag/tension measurements (per design spans in Euphorbia area), and continuity tests.
- Electrical Tests:
 - Tower Ground Resistance ($\leq 10\Omega$ per EN 50341: To be measured before any ground wire stringing)
 - Insulation resistance (megger test at 5kV DC, minimum 1,000 M Ω).
- OPGW Tests: End-to-end continuity, attenuation, and splice loss (OTDR per IEC 60794).

- **Special Areas:** In sensitive zones (e.g., Euphorbia area near Kasama, as marked on the line route map), confirm no environmental impacts post-installation via ecologist inspections.

Acceptance Criteria (Example; ZESCO to consider, and Contractor to propose detail plan per its proposal).

Test Type	Parameter	Acceptance Limit	Reference Standard
Insulation Resistance	Minimum Value	>1,000 MΩ	IEC 60060
Ground Resistance	Per Tower	≤10Ω	EN 50341
OPGW Attenuation	Fiber Loss	<0.25 dB/km	IEC 60794
Sag/Tension	Deviation from Design	±5%	IEC 60826

Tests on completion

At least 90 days prior the completion of the first line section the Contractor shall submit a schedule of energizing. The schedule of energizing shall contain a sequence of how the Contractor intends to energize the different parts of the different line sections.

Prior to the energizing of a complete line sections a visual inspection of this line section including the shield wire system has to be performed and deficiencies which would affect the safety of the line and personnel are to be rectified immediately.

The following tests shall be performed before energizing of the system:

- insulation measurement
- line impedance

The line shall be energized at full working voltage before handing over and the arrangement for this, and such other tests as the Employer or the Employer's Representative shall desire to make on the complete line, shall be assisted by the Contractor who shall provide such labor, transport and other assistance as is required without extra charge.

All materials used in the Contract Works shall be made available for inspection and test by the Employer during manufacture, and it is the Contractor's responsibility to advise Employer when equipment and materials are available for inspection.

The Employer has the right to inspect materials and equipment, and witness factory tests of any plant and equipment included in this Contract.

Each consignment of material shall be inspected and tested in the presence of Employer or their representatives.

The Contractor shall give at least forty-five (45) days’ notice of the date, time and place of inspection to the Employer so that arrangements can be made to have the inspection witnessed or issue the Inspection Waiver Certificate.

Four (4) weeks prior to the tests, the Contractor shall submit an outline of the procedures and tests in its plans to demonstrate fulfilment of the requirements specified in the subsequent sections of the detailed technical specifications.

The Contractor shall carry out the tests stated in the Tests section of this Technical Specification in accordance with the conditions thereof and the latest applicable Standards or Recommendations and such additional tests as in the opinion of the Employer are necessary to determine that the Works comply with the conditions of this Specification either under test conditions (in the Manufacturer's Works, on the Site, or elsewhere), or in ordinary working.

Type tests necessary to prove compliance with the Specification and not specifically mentioned in the Schedules shall be undertaken at no extra cost to Employer. Type tests may be omitted at the discretion of the Employer if satisfactory evidence is given of such tests already made on identical equipment. Type test records and certificates may be accepted provided that those records and certificates are not older than eight years and tests were carried in accredited laboratory.

All materials used shall also be subjected to and shall withstand satisfactorily such routine tests as are customary in the manufacture of the types of plant or material included in the Works.

The original and copies of test records whether or not they have been witnessed by the Employer shall be supplied to the Employer.

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

The Contractor shall be responsible for the proper testing of work completed or plant or materials supplied by a Sub-Contractor to the same extent as if the work, plant or materials were completed or supplied by the Contractor himself.

Uplift and compression tests on special foundations, including tests on piles, or other additional tests including bore holes and specialist soil tests, when instructed by the Employer, shall be paid for at the rates stated in Price Schedules.

The cost of all routine or sample tests on materials and/or analyses shall be borne by the Contractor.

The cost of additional tests and/or analyses required by the Employer and effected elsewhere than at the works of the Contractor or a Subcontractor or on the Site will be borne by Employer should such tests prove satisfactory.

The Contractor will be called upon to pay all expenses incurred by the Employer in respect of any work or material found to be defective, of inferior quality, adulterated or otherwise unacceptable.

The Contractor shall supply suitable test pieces of all materials as required by the Employer. If required by the Employer test specimens shall be prepared for check testing and forwarded at the expense of the Contractor to an independent testing authority selected by the Employer.

No inspection or passing by the Employer of work, plant or materials whether carried out by the Contractor or sub-Contractor, shall relieve the Contractor from his liability to complete the Contract works in accordance with the Contract or exonerate him from any of his guarantees.

11.2 Compulsory Witnessed Tests

Factory/laboratory type or acceptance tests must be witnessed. Costs of these tests including the compulsory witnessing shall be included in the price unless such tests are named in the Price Schedules and, if satisfactory and approved, shall be paid for at the rates stated in the Price Schedules.

At least 45 days' notice of the date, time and place of all tests shall be given to Employer so that arrangements can be made to have the test witnessed.

Prices for type/acceptance tests shall include manufacture, supply, erection and dismantling of all materials and provision of all test facilities.

The bidder shall cost for testing facilities, his participation, associated logistics and local transportation to test facility for all parties.

The Employer and Engineer shall be responsible for own costs of FAT (air travel, accommodation, per diems). The bidder shall estimate participation of four (04) personnel per FAT session (Three Employer Representatives and one Engineer Representative). The days will vary depending on the equipment to be tested and some tests could be grouped together and attended by one group of people from a minimum of seven (07) days.

Any costs incurred by the Employer in attending a repeat type test brought about as a result of a failure of the subject under test and postponement of the test programme shall be to the account of the Contractor.

12 DRAWINGS and OHTL COORDINATES

For drawings, see below Appendix 1.

12.1 OHTL coordinates

12.1.1 400kV OHTL 330kV Nakonde stepdown S/S – Tanzania border, Angle points

Angle Points	Tower	Beacon ID	Angle WGS84 UTM-36S	Points	Angle gon	Angle deg	Dist. To prev. Angle
Nr			Easting (E)	Northing (N)			
1		NT001	456477,160	8963886,740			
2		NT002	456270,390	8964263,030	30,54	27,48	429
5		NT003	456248,630	8965216,810	-19,73	-17,75	954
15		NT004	455030,260	8968743,020	14,12	12,71	3 731
22		NT005	454753,020	8971232,230	40,39	36,35	2 505
34		NT006	456894,030	8974941,030	9,68	8,71	4 282
37		NT007	457602,910	8975825,630	-16,09	-14,48	1 134
39		NT008	457913,560	8976515,980			757

Length [km]15

12.1.2 330kV OHTL Kasama S/S – 330kV Nakonde stepdown S/S, Angle points

Angle Points	Tower	Beacon ID	Angle WGS84 UTM-36S	Points	Angle gon	Angle deg	Dist. To prev. Angle
Nr			Easting (E)	Northing (N)			
1		KN001	298167,090	8868742,790			
2		KN002	298252,500	8868844,960	37,66	33,89	133
3		KN003	298422,890	8868894,500	100,00	90,00	177
5		KN004	298638,040	8868154,570	-32,22	-29,00	771
23		KN005	303059,300	8863765,550	-69,64	-62,68	6 230
28		KN006	304839,840	8864340,200	-64,28	-57,85	1 871
45		KN007	306367,300	8870350,930	44,55	40,09	6 202
62		KN008	311288,810	8873880,880	-6,63	-5,97	6 057
199		KN009	348466,630	8906908,650	14,58	13,12	49 730
205		KN010	350260,970	8907882,780	-37,12	-33,41	2 042
209		KN011	350890,300	8909061,780	22,55	20,29	1 336
226		KN012	355483,940	8913142,630	-49,12	-44,21	6 144
233		KN013	355658,520	8915532,560	72,29	65,06	2 396
246		KN014	360046,600	8917195,980	-18,99	-17,09	4 693
298		KN015	374703,420	8928587,440	-70,71	-63,64	18 563
304		KN016	374277,430	8930681,890	83,55	75,19	2 137
338		KN017	385327,000	8936143,760	-50,51	-45,46	12 326
386		KN018	390653,860	8952313,340	61,43	55,29	17 024
389		KN019	391722,100	8952629,270	-48,12	-43,30	1 114
393		KN020	392437,010	8953856,630	69,82	62,84	1 420
402		KN021	395409,710	8953697,680	-21,38	-19,24	2 977
451		KN022	412390,360	8958624,600	0,22	0,20	17 681
469		KN023	418925,610	8960496,320	-41,43	-37,29	6 798
490		KN024	423451,990	8966562,190	27,38	24,64	7 569
516		KN025	431383,720	8970891,740	28,11	25,30	9 036
540		KN026	440246,100	8971406,950	45,96	41,36	8 877
574		KN027	450549,650	8963346,880	-46,98	-42,28	13 082
583		KN028	453708,950	8963581,490	-0,60	-0,54	3 168
591		KN029	456477,161	8963813,169			2 778

Angle Points	Tower	Beacon ID	Angle WGS84 UTM-36S	Points	Angle gon	Angle deg	Dist. To prev. Angle
Nr			Easting (E)	Northing (N)			
Length [km]							212

12.1.3 132kV OHTL 330kV Nakonde stepdown S/S – Isoka 66kV OHTL Loop-in / Loop-out

Angle Points	Tower	Beacon ID	Angle WGS84 UTM-36S	Points	Angle gon	Angle deg	Dist. To prev. Angle
Nr			Easting (E)	Northing (N)			
1		NI001	456827,740	8963790,890			
7		NI002	458826,290	8963963,180	0,69	0,62	2 006
33		NI003	467213,080	8964594,570	68,67	61,80	8 411
35		NI004	467546,220	8964071,700	-41,91	-37,72	620
39		NI005	468705,210	8963655,030	-34,19	-30,77	1 232
40		NI006	468824,180	8963678,150			121

Length [km]

12

13 ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY SPECIFICATION (ESHS)**13.1 Environmental and Social (ES) Requirements**

Environmental and Social (ES) requirements shall be according to the ESIA conforming to Zambian Regulations and World Bank safeguards.

The following is a non-exhaustive list of Sub-Clauses of the Conditions of Contract that refers to ES matters stated in the Specification.

GCC	Sub-Clause/Clause	Remarks
9.10	Training of Contractor’s and its Sub-Contractors’ Personnel	<i>Training as specified in the ZTIP ESMP shall include, but not be limited to, the following trainings:</i> • <i>ZESCO’s SHEQ Policy Requirements.</i> • <i>Occupational Health and Safety, and Emergency Response.</i> • <i>Introduction to the Working Environment, Policies, Procedures, and Practices and organisational Structure.</i> • <i>Implementation of Biodiversity Management Plans and other detailed management plans.</i> • <i>Implementation of ZTIP ESMP.</i> • <i>Sexual Exploitation, Abuse and Harassment Gender Based Violence Action Plan (SEA/SH/GBV) Awareness, Prevention, and Response.</i> • <i>Worker and Community Grievance Mechanism.</i> • <i>ZTIP Labour Management Procedure (OHS risk assessment, and labour and working conditions, including compliance with national labour laws and combatting child labour and forced labour).</i> • <i>ZTIP Environmental and Social Commitment Plan (ESCP) and Stakeholder Engagement Plan (SEP).</i> • <i>Training on the Chance Find Procedure and the importance of cultural heritage protection prior to the commencement of works.</i> • <i>Biodiversity awareness for sensitive areas (e.g., Euphorbia).</i> • <i>Gender equal workforce following "Gender Equality Strategy and Action Plan for the Energy Sector" by the Zambia Ministry of Energy.</i>
20	Design and Engineering	<i>The Contractor shall:</i> • <i>Assess local flood risk for substations and transmission lines and determine if flood monitoring and/or flood proofing is required.</i> • <i>Consider impacts of extreme rainfall and flooding as well as drought impacts on soil stability for pylon and substation foundation and design.</i> • <i>Consider future temperature projections in transmission line and substation design.</i> • <i>Consider future wind projections in pylon design.</i> • <i>Adopt the principles of universal design and reasonable adjustments principles, taking necessary measures to make the workplace accessible and supportive of disabled employees.</i> <i>Risks to the public / community include:</i> • <i>Accidents and physical injuries to workers and community personnel arising from site preparation, construction activities, traffic, waste and hazardous materials etc.</i> • <i>Electrocution from direct contact with high-voltage electricity.</i> • <i>Noise in the form of buzzing or humming from transformers or high voltage power lines.</i> • <i>Risks of involuntary resettlement/displacements (Economic & physical).</i> • <i>Impacts on critical habitats (e.g., Euphorbia area near Kasama)</i>
22.2.4	Rates of wages and conditions of labor	<i>The conditions of labor and rates of wages shall be in accordance with the Labour Management Procedure, and with the following national Labour Legislation:</i> • <i>The Employment Code Act No.3 of 2019 and subsidiary legislation under it, including the The Employment Code</i>

GCC	Sub-Clause/Clause	Remarks
		<i>(Minimum Wages and Conditions of Employment) (General) Order, 2023 and others.</i> • <i>The Industrial and Labour Relations Act, CAP 269 of 1993</i> • <i>Anti-Gender Based Violence Act No. 1 of 2011.</i>
22.2.6	Facilities for Staff and Labor	• <i>Subject to the approval of respective local authority and clearance by the Supervising Engineer, the Contractor shall provide, maintain and operate camps and facilities necessary for maintaining an efficient and safe working environment for housing, feeding, sanitation, and accommodation of all Contractor personnel.</i> • <i>The Project shall require two types of camps namely, substation camps and transmission line camps.</i> • <i>Separate accommodation and sanitation facilities shall be provided in work camps for women and men as prescribed by international worker health standards such as the IFCEBRD Joint Guidance Note on Worker Accommodations (Appendix 3-4) and in the Factories Act of Zambia legislation</i> • <i>The Contractor’s C-ESMP shall set out the measures the Contractor will take to ensure that facilities for staff and labour are appropriate.</i> • <i>Further reference may be made to the ESMP regarding worker accommodations.</i>
22.8	Security of the Site	<i>The Contractor shall ensure site security measures such as but not limited to the following:</i> • <i>Site access control.</i> • <i>Provision of security personnel.</i> • <i>Hiring of female security personnel to handle female related security issues.</i> • <i>Ensure sufficient signage.</i> • <i>Include a security manager to handle community grievances related to security.</i> • <i>Include a security plan.</i> • <i>Provide Separate male and female toilets.</i> • <i>Provide sufficient lighting that ensures avoidance of light pollution.</i>
22.9	Protection of the Environment	<i>The Contractor shall obtain relevant permits/licenses from the Zambia Environmental Management Agency (ZEMA), Energy Regulation Board (ERB) and respective Local Authorities for various activities being conducted that may have an adverse impact on the environment. These permits/licenses will be site specific, and may include, but not be limited to, the following:</i> • <i>Hazardous Waste Management License (Generation, Storage, Handling): Hazardous waste shall include but not be limited to used oils, expired chemicals, used fuels, used fuel or oil filters etc.). No medical waste shall be generated and stored at site.</i> • <i>Solid Waste Management License.</i> • <i>License to manage a waste disposal site (if necessary).</i> • <i>Effluent Discharge Permit.</i> • <i>Air Emission Permit (to cover aspects such as, but not limited to, emissions from Diesel Generators etc.).</i> • <i>Management of Chemicals Permit (Pesticides and Toxic Substances).</i> • <i>License to store Dangerous Petroleum (for any fuel storage areas, filling stations etc.).</i> • <i>Any licenses/permits to manage/operate filling stations (if temporal filling stations will be installed).</i> <i>The Contractor’s C-ESMP shall set out the measures the Contractor will take to ensure compliance with the requirements and conditions of each permit/license obtained.</i>

GCC	Sub-Clause/Clause	Remarks
22.12	Cultural Heritage Findings	<i>The Contractor shall be expected to ensure strict adherence to local cultural heritage requirements as provided in the relevant documents and the Cultural Heritage Management Plan as well as well as the Chance Find Procedures as detailed in the ESMP. Where cultural heritage sites exist, local laws and procedures shall be followed, and the Contractor shall promptly inform the employer before any action or gaining access.</i> <i>The Contractor must comply with national cultural heritage laws, National Heritage Conservation Act and regulations under the National Heritage Conservation Commission (NHCC) and the World Bank’s ESS8. This includes conducting:</i> <i>• Pre-construction assessments.</i> <i>• Protecting known heritage sites with necessary approval.</i> <i>• Following the Chance Find Procedures (CFP) if unexpected cultural heritage (e.g., artifacts, remains) is discovered such as halting work, securing the area, notifying authorities, and following guidance. All staff must be trained in these procedures, and all findings must be documented and reported. Non-compliance may lead to work suspension and penalties.</i>

13.1.1 Management and Safety of Hazardous Materials

As applicable, specify requirements for the management and safety of hazardous materials (see ESF - ESS4 para. 17 and 18 and relevant guidance notes as well as the Residual material and hazardous products management plan as detailed in the ESMP).

The Contractor shall prepare these plans to include:

- A full inventory of hazardous materials expected to be used, transported, or stored on site.
- Secure storage facilities with bunds, spill containment systems, clear labeling, and restricted access.
- Training programs for workers on handling, use, and disposal of hazardous materials, aligned with Material Safety Data Sheets (MSDS).
- Procedures for spill prevention, emergency response, and accident reporting.
- Segregated storage and disposal systems for hazardous vs. non-hazardous waste.
- Compliance with ZEMA permitting requirements and regular inspections by the Supervising Engineer or Employer.

Maintenance of a Hazardous Materials Register to be updated monthly

13.1.2 Resource Efficiency and Pollution Prevention and Management

As applicable specify Resource Efficiency and Pollution Prevention and Management measures (see ESF - ESS3 and relevant guidance notes as well as the Pollution prevention Management plan as detailed in the ESMP).

- **Resource efficiency**

The Contractor shall specify, as applicable, measures for improving efficient consumption of energy, water and raw materials, as well as other resources not limited to the following:

✓ **Energy:** The Contractor shall identify and implement opportunities to optimize energy use, including:

- Use of energy-efficient machinery.
- Minimization of idle time for diesel-powered equipment.
- Installation of solar or hybrid systems in temporary camps and offices where applicable.
- Monthly tracking and reporting of fuel and energy use.

✓ **Water:** The Contractor shall specify any applicable measures that avoid or minimize water usage, to minimize significant adverse impacts on communities, other users and the environment. The Contractor shall but not limited to the following:

- Install low-flow water fixtures in worker camps and on-site facilities.
- Use non-portable water for dust suppression and concrete mixing where applicable.
- Prevent contamination of local water sources.
- Monitor and report water use monthly.

✓ **Raw materials:** When the Facilities have been assessed to involve a potentially significant use of raw materials, the Contractor shall specify any applicable measures to support efficient use of raw materials. The Contractor shall among other measures:

- Prioritize use of locally sourced and recycled materials.
- Design processes to minimize raw material waste.
- Reuse excess construction materials where feasible.
- Maintain a Material Consumption and Waste Register, updated monthly.

- **Pollution prevention and management** (See also GCC Sub-Clause 22.9 and the table above)

- Management of air pollution: The Contractor shall specify any measure to avoid or minimize the air pollution including but not limited to:
 - Implementing dust suppression measures.
 - Limiting diesel generator use and opt for energy-efficient alternatives.

- Ensuring regular machinery maintenance.
- Prohibiting open burning of waste.
- **Management of hazardous and nonhazardous wastes:** The Contractor shall specify any applicable measures to minimize the generation of waste, and reuse, recycle and recover waste in a manner that is safe for human health and the environment including storage, transportation and disposal of hazardous wastes. The Contractor shall develop and implement a Waste Management Plan that:
 - Categorizes waste streams (hazardous, organic, recyclable, general).
 - Provides for segregation, storage, and removal by licensed providers.
 - Reuses and recycles suitable materials.
 - Ensures safe hazardous waste disposal including expired chemicals, oil filters, and medical waste (if any).
- **Management of chemicals and hazardous materials:** The Contractor shall specify any applicable measures to minimize and control the release and use of hazardous materials including but not limited to:
 - Avoiding the use of banned/prohibited or high-risk chemicals.
 - Storing chemicals as per best industry practices and ZEMA guidelines.
 - Using of spill containment kits at all chemical and fuel storage locations.
 - Maintaining chemical usage logs, reviewed monthly.

13.1.3 Biodiversity Conservation and Sustainable Management of Living Natural Resources

The Contractor shall:

- Implement all Biodiversity Management Plans (BMPs) included in the ESIA/ESMP. For information of the critical habitat for the *Euphorbia Perplexa* Var. *Kasamana*, an endangered species. This critical habitat is in the Mwela Rock Art Site, which is part of the Kasama Forest Reserve, and a heritage site under the charge of the National Heritage Conservation Commission (NHCC), see below Appendix 2.
- The critical habitat requires a detailed survey and setting out of all Euphorbia outcrops in the vicinity of the working area for the line route and access road.
- Adopt and explicitly reference the mitigation hierarchy per ESS6.
- Avoid unnecessary clearing of vegetation and identify and protect ecologically sensitive areas near work zones.
- Schedule construction works outside the breeding or migration periods for key wildlife species (where identified).
- Provide biodiversity awareness training to workers, especially in ecologically sensitive locations.
- Monitor impacts and report biodiversity incidents or habitat disturbances monthly.

For Sensitive Euphorbia area near Kasama, the Contractor shall:

- Optimize towers design to minimize footprints (as per line route map).
- Conduct pre-construction LIDAR/GPS surveys for outcrops/no-go zones.
- Mandate manual logistics (no machinery), ecologist sign-off, monitoring per BMP.
- Prohibit clearing outside corridors.

13.1.4 Road Safety

The contractor shall ensure that road safety is considered due to the increased traffic in the project vicinity and detailed in the Contractor’s Community Health and Safety Plan. The Contractor shall further:

- Prepare and implement a Traffic and Road Safety Management Plan as part of the Community Health and Safety Plan.
- Conduct road safety risk assessments for communities.
- Provide signage, flaggers, and enforce speed limits.
- Schedule transport to avoid peak traffic periods.
- Ensure pedestrian safety and install barriers near hazards.

13.1.5 ESHS Monitoring and Compliance Reporting

To meet ESHS Monitoring, Compliance and Reporting Obligations the contractor shall:

- Submit monthly ESHS compliance reports to the Supervising Engineer, including updates on the implementation of the C-ESMP, incidents/accidents, grievances, training records, and labor conditions.
- Participate in monthly/quarterly ESHS audits, led by the Employer or third-party experts.
- Implement all corrective actions arising from audit findings or grievance outcomes within timelines agreed with the Employer.
- Failure to comply with ESHS requirements shall result in financial penalties, work stoppages, or contract termination, as deemed necessary by the Employer.
- Ensure consistent Community engagement during construction and operations on planned activities.

14 SUPPLEMENTARY INFORMATION

Bidders shall review attached reports (e.g., soil classes for foundations) and propose adjustments if needed, with justification

13.1	Geotechnical Investigation Report
13-2	Hydrological Investigation Report
13-3	ESIA and ESMP
13-4	ZEMA Permit

14.1 **Geotechnical Investigation Report**

14.2 **Hydrological Investigation Report**

14.3 **ESIA and ESMP**

14.4 **ZEMA Permit**

APPENDIX 1

DRAWINGS

400kV OHTL Nakonde stepdown S/S – Tanzania Border

400kV NAK – TAN BORDER Line Profile
400kV NAK – TAN BORDER Staking Table
400kV NAK – TAN BORDER d.c. Towers
400kV NAK – TAN BORDER foundations

330kV OHTL Kasama S/S – Nakonde stepdown S/S

330kV KAS – NAK Line Profile
330kV KAS – NAK Staking Table
330kV KAS – NAK d.c. Towers
330kV KAS – NAK foundations

132kV OHTL Nakonde stepdown S/S – Isoka Line (66)132kV

132kV NAK – ISO Line Profile
132kV NAK – ISO Staking Table
132kV NAK – ISO d.c. Towers
132kV NAK – ISO foundations

Line Route Overview

Line Route Overview (Google Earth)

Grounding System

Transmission Line Grounding System_Rev00_08072026

Wooden Poles

12m Eucalyptus Pole Technical Specifications_Rev03_18052022

APPENDIX 2 CRITICAL HABITAT FOR THE EUPHORBIA PERPLEXA VAR. KASAMANA, IN THE MWELA ROCK HERITAGE SITE

Information about Critical habitat along a portion of the Kasama – Nakonde line route. [Refer to attachment Appendix 2 “Euphorbia Perplexa Var. Kasamana, Mwela Rock Heritage Site.](#)

TECHNICAL SCHEDULES

Schedule No.	Description of Particulars
0.	General Requirements
0.1.	Climatic Conditions
0.2.	Galvanizing Minimum above ground
0.3.	Grounding
0.4.	Main Design Data 400 kV Transmission Line, 2200 m.a.s.l
0.5.	Main Design Data 330 kV Transmission Line, 1600 m.a.s.l
0.6.	Main Design Data 132 kV Transmission Line, 1600 m.a.s.l
0.7.	Mechanical Design of OHL
0.8.	Soil Investigations
0.9.	Cross-Border Stringing
1.	Conductors and Cables
1.1.	Conductor: ACSR Bluejay
1.2.	Conductor: ACSR Bison
1.3.	Conductor: ACSR Wolf
1.4.	Optical Ground Wire (OPGW) 400kV
1.5.	Optical Ground Wire (OPGW) 330kV & 132kV
1.6.	ADSS Optical Fibre Cable
1.7.	Optical Ground Wire Splice Box (400kV)
1.8.	Optical Ground Wire Splice Box (330kV & 132kV)
1.9.	Overhead Ground Wire / Shield Wire (OHGW) 400kV
1.10.	Overhead Ground Wire / Shield Wire (OHGW) 330kV
2.	Civil
2.1.	Gabions for erosion protection
2.2.	Gravelled Access road
3.	Lattice Steel Towers
3.1.	Tower Members
3.2.	Bolts, Nuts and Washers
3.3.	Lattice Steel Towers: Suspension tower 400DA (0° - 2° angle)
3.4.	Lattice Steel Towers: Angle tension tower 400DB (0° - 10° angle)
3.5.	Lattice Steel Towers: Angle tension tower 400DC (10° - 30° angle)
3.6.	Lattice Steel Towers: Angle tension tower 400DD (30° - 60° angle)
3.7.	Lattice Steel Towers: Angle tension tower 400DE (60° - 90° angle)
3.8.	Lattice Steel Towers: Terminal tension tower 400DET (0° - 45° Entry & Exit)
3.9.	Lattice Steel Towers: Suspension tower 330DA (0° - 2° angle)
3.10.	Lattice Steel Towers: Angle / Anti-cascading tower 330DB (0° - 10° angle)
3.11.	Lattice Steel Towers: Angle tension tower 330DC (10° - 30° angle)
3.12.	Lattice Steel Towers: Angle tension tower 330DD (30° - 60° angle)
3.13.	Lattice Steel Towers: Angle tension tower 330DE (60° - 90° angle)
3.14.	Lattice Steel Towers: Terminal tension tower 330DET (0° - 45° Entry & Exit)
3.15.	Lattice Steel Towers: Transposition tower 330DT (0° - 10°)
3.16.	<i>[Deleted]</i>
3.17.	Lattice Steel Towers: Suspension tower 132DA (0° - 2°)
3.18.	Lattice Steel Towers: Angle tension tower 132DB (0° - 30°)
3.19.	Lattice Steel Towers: Angle tension tower 132DC (30° - 60°)
3.20.	Lattice Steel Towers: Angle tension tower 132DD (60° - 90°)
3.21.	Lattice Steel Towers: Terminal tension tower 132DET (0° - 45° Entry & Exit 45°)
3.22.	Lattice Steel Towers: Angle tension tower 132SPEC (90° + 90° angle)
3.23.	Lattice Steel Towers: 400kV - Leg and Body Extensions
3.24.	Lattice Steel Towers: 330kV - Leg and Body Extensions
3.25.	Lattice Steel Towers: 132kV - Leg and Body Extensions
3.26.	Estimated Weight of 330kV Tower
3.27.	Estimated Weight of 400kV Tower
3.28.	Estimated Weight of 132kV Tower
3.29	12m Wooden Poles

4.	Foundations
4.1.	Foundations: Material
4.2	Estimated Tower Foundation Details
5.	Insulators and fittings
5.1.	Insulators: Glass Insulator 120kN
5.2.	Insulators: Glass Insulator 160kN
5.3.	Insulators: Glass Insulator 210kN
5.4.	Single/Jumper Suspension String Assembly for 400kV Line
5.5.	Single/Jumper Suspension String Assembly for 330kV Line
5.6.	Double Suspension String Assembly for 400kV Line
5.7.	Double Suspension String Assembly for 330kV Line
5.8.	Double Tension String Assembly for 400kV Line
5.9.	Double Tension String Assembly for 330kV Line
5.10.	132kV Composite Insulator String
5.11.	Composite Suspension Insulator 132kV
5.12.	Composite Tension Insulator 132kV
5.13.	Fittings: Hardware and fittings for Optical Ground Wire
5.14.	Fittings
6.	Overhead Line Accessoires
6.1.	Midspan Joints and Dead-End Fittings for ACSR Bluejay
6.2.	Midspan Joints and Dead-End Fittings for ACSR Bison
6.3.	Midspan Joints and Dead-End Fittings for ACSR Wolf
6.4.	Midspan Joints and Dead-End Fittings for ACSR 95/55
6.5.	Midspan Joints and Dead-End Fittings for ACS 7/6 AWG
6.6.	Repair Sleeves for Conductor ACSR Bluejay
6.7.	Repair Sleeves for Conductor ACSR Bison
6.8.	Repair Sleeves for Conductor ACSR Wolf
6.9.	Dampers for Conductor ACSR Bluejay
6.10.	Dampers for Conductor ACSR Bison
6.11.	Dampers for Conductor ACSR Wolf
6.12.	Dampers for Conductor ACSR 95/55
6.13.	Dampers for Conductor ACS 7/6 AWG
6.14.	Dampers for OPGW similar to ACSR 95/55
6.15.	Dampers for OPGW similar to ACS 7/6 AWG
6.16.	Spacers for Conductor ACSR Bluejay
6.17.	Spacers for Conductor ACSR Bison
6.18.	Jumper Spacers for Conductor ACSR Bluejay
6.19.	Jumper Spacers for Conductor ACSR Bison
6.20.	Spacer Damper for Conductor ACSR Bluejay (If Proposed)
6.21.	Spacer Damper for Conductor ACSR Bison (If Proposed)
6.22.	Bird Diverter for OPGW type ACSR 95/55 (as per Biodiversity Management Plan)
6.23.	Bird Diverter for Conductor ACSR 95/55 (as per Biodiversity Management Plan)
6.24.	Bird Diverter for OPGW type ACS 7/6 AWG (as per Biodiversity Management Plan)
6.25.	Bird Diverter for Conductor ACS 7/6 AWG (as per Biodiversity Management Plan)
6.26.	Aircraft Warning Spheres
7.	Earthing Material
7.1.	Counterpoise Cable
7.2.	Counterpoise Compression Joints
7.3.	Clamp or Lug for Connection to Tower Leg
7.4.	Earth Rods
8.	Tools and Equipments
8.1.	Schmidt Concrete Test Hammer
8.2.	Ultra Sonic Pulse Velocity Tester
8.3.	Rebar Cover Meter
8.4.	5 Ton hydraulic Petrol Operated Tower Erection Winch
8.5.	Single-Phase Gen-Welder Machine

8.6.	Three-phase Gen-welder machine
8.7.	6 Tonne Chain Blocks
8.8.	Live Line Tester up to 330kV High Voltage Detectors Cable for Voltage up to 500kV
8.9.	High Frequency Earth Resistance Measuring Instrument Digital Ground Tester
8.10.	Leica Total Station LS10
8.11.	Leica Total Station LS15
8.12.	Leica TS16
8.13.	DRONE
8.14.	LEICA GS 18T
8.15.	Special Tools for Euphorbia Critical Habitat
8.16	OPTICAL FIBRE FUSION SPLICING (OPTIC FIBRE JOINING) MACHINE
8.17	Optical Time-Domain Reflectometer (OTDR)

0.

General Requirements

0.1.

Climatic Conditions

Item	Description	ZTIP	Offered	Unit
0.1.1	Maximum outdoor temperature;	+45		°C
0.1.2	Minimum outdoor temperature	-1		°C
0.1.3	Annual average air temperature	+25		°C
0.1.4	Design maximum temperature	+45		°C
0.1.5	Design minimum temperature	-1		°C
0.1.6	Precipitation (rain, annual average)	1100		mm/year
0.1.7	Maximum monthly average relative humidity	100		%
0.1.8	Design wind (gust, 3 sec)	36		m/s
0.1.9	[Deleted]			
0.1.10	Keraunic level (average ground flashes/km² / year)	38		No/km²/year
0.1.11	Maximum solar radiation on plan	1035		W/m²
0.1.12	Exposed bare metal temperature	+75		°C
0.1.13	Maximum temperature of conductors	+80		°C
0.1.14	Maximum temperature of earth wire	+50		°C
0.1.15	Maximum temperature after short cicuit or earth fault of conductors in substation and first span of lines	+200		°C
0.1.16	Altitude above sea level;	1600		masl
0.1.17	Design altitude of 400kV transmission lines	2200		masl
0.1.18	Design altitude of 330kV and 132kV transmission lines	1600		masl
0.1.19	Altitude correction factor 400kV transmission line (Ka)	1.16		-
0.1.20	Altitude correction factor 330kV and 132kV transmission line (Ka)	1.08		-
0.1.21	Safety factor (Ks)	1.05		-
0.1.22	Seismic intensity (Modified Mercalli scale); (330kV and 132kV OHTL)	VI (strong)		-
0.1.23	Seismic intensity (Modified Mercalli scale); (400kV OHTL)	VII (very strong)		-
0.1.24	Atmosphere pollutants	Sand, dust, H ₂ S		
0.1.25	Pollution class transmission line 400kV, Creepage distance (IEC60815)	USCD (e) 53.7		mm/kV
0.1.26	Pollution class transmission lines, 330kV and 132kV (IEC60815)	USCD (d) 43.3		mm/kV
0.1.27	Degree of protection, outdoor	IP56		-

0.2.

Galvanizing Minimum above ground

Item	Description	ZTIP	Offered	Unit
0.2.1	Steel > 6 mm local coating min	505; 70		g/m²; µm
0.2.2	Steel > 6 mm mean coating min	610; 85		g/m²; µm
0.2.3	Steel > 3 mm to u 6 mm local coating min	395; 55		g/m²; µm
0.2.4	Steel > 3 mm to u 6 mm mean coating min	505; 70		g/m²; µm
0.2.5	Steel W 1.5 mm to u 3 mm local coating min	325; 45		g/m²; µm
0.2.6	Steel W 1.5 mm to u 3 mm mean coating min	395; 55		g/m²; µm
0.2.7	Steel < 1.5 mm local coating min	250; 35		g/m²; µm
0.2.8	Steel < 1.5 mm mean coating min	325; 45		g/m²; µm
0.2.9	Castings W 6 mm local coating min	505; 70		g/m²; µm
0.2.10	Castings W 6 mm mean coating min	575; 80		g/m²; µm
0.2.11	Castings < 6 mm local coating min	430; 60		g/m²; µm
0.2.12	Castings < 6 mm mean coating min	505; 70		g/m²; µm

0.3.

Grounding

Item	Description	ZTIP	Offered	Unit
0.3.1	Maximum permissible current/mm² during 1 sec.:			
0.3.2	Copper	200		A/mm²
0.3.3	Aluminum	100		A/mm²
0.3.4	Steel	65		A/mm²

0.4.

Main Design Data 400 kV Transmission Line, 2200 m.a.s.l

Item	Description	ZTIP	Offered	Unit
0.4.1	Nominal system voltage, Un	400		kV r.m.s
0.4.2	Rated voltage, Ur;	420		kV r.m.s
0.4.3	Rated short-time withstand current (1 sec)	40		kA
0.4.4	Power Frequency Withstand Voltage, U _{pf}	670		kV
0.4.5	Lightning Impulse Withstand Voltage, U _{peak}	1675		kV
0.4.6	Rated frequency	50 ±2.5%		Hz
0.4.7	Number of circuits	2		No.

0.4.8	Numbers of conductors per phase	2		No.
0.4.9	Bundle spacing of conductors per phase	45		cm
0.4.10	Type of conductor	ACSR Bluejay		-
0.4.11	Number of shield wires	2		No.
0.4.12	Type shield wire 1	ACSR 95/55		-
0.4.13	Type shield wire 2	OPGW 48 fibres (similar to ACSR 95/55)		-
0.4.14	System earthing method	Effectively grounded		-
0.4.15	Conductor thermal rating deliverables (PLS-CADD .TRF files for Bluejay - Twin bundle)	Bidder to submit		-
0.4.16	Tower footing resitance	<=10		Ohm

0.5. Main Design Data 330 kV Transmission Line, 1600 m.a.s.l

Item	Description	ZTIP	Offered	Unit
0.5.1	Nominal system voltage, Un;	330		kV r.m.s
0.5.2	Rated voltage, Ur;	362		kV r.m.s
0.5.3	Rated short-time withstand current (1 sec)	40		kA
0.5.4	Power Frequency Withstand Voltage, U _{pf}	580		kA
0.5.5	Lightning Impulse Withstand Voltage, U _{peak}	1300		kV
0.5.6	Rated frequency	50 ±2.5%		Hz
0.5.7	Number of circuits	2		No.
0.5.8	Numbers of conductors per phase	2		No.
0.5.9	Bundle spacing of conductors per phase	45		cm
0.5.10	Type of conductor	ACSR Bison		-
0.5.11	Number of shield wires	2		No.
0.5.12	Type shield wire 1	ACS 7/6 AWG		-
0.5.13	Type shield wire 2	OPGW 48 fibres (similar to ACS 7/6 AWG)		-
0.5.14	System earthing method	Effectively grounded		-
0.5.15	Conductor thermal rating deliverables (PLS-CADD .TRF files for Bison - Twin bundle)	Bidder to submit		-
0.5.16	Tower footing resitance	<=10		Ohm

0.6. Main Design Data 132 kV Transmission Line, 1600 m.a.s.l

Item	Description	ZTIP	Offered	Unit
0.6.1	Nominal system voltage, Un;	132		kV r.m.s
0.6.2	Rated voltage, Ur;	145		kV r.m.s
0.6.3	System design short circuit current (1 sec)	40		kA
0.6.4	Power Frequency Withstand Voltage, U _{pf}	275		kV
0.6.5	Lightning Impulse Withstand Voltage, U _{peak}	750		kV
0.6.6	Number of circuits	2		No.
0.6.7	Numbers of conductors per phase	1		No.
0.6.8	Type of conductor	ACSR Wolf		-
0.6.9	Rated frequency	50 ±2.5%		Hz
0.6.10	Number of shield wires	1		No.
0.6.11	Type shield wire 1	OPGW 48 fibres (similar to ACS 7/6 AWG)		-
0.6.12	System earthing method	Effectively grounded		-
0.6.13	Conductor thermal rating deliverables (PLS-CADD .TRF files for Wolf - Single)	Bidder to submit		-
0.6.14	Tower footing resitance	<=10		Ohm

0.7. Mechanical Design of OHL

Item	Description	ZTIP	Offered	Unit
0.7.1	Factors:			
0.7.2	Dynamic reference wind pressure q0	Bidder to calculate		Pa
0.7.3	Combined drag factor for lattice steel structures Gt	1.92		IEC 60826
0.7.4	Combined drag factor for conductors GC	1.85		IEC 60826
0.7.5	Combined drag factor for insulators Gt	1.92		IEC 60826
0.7.6	Drag coefficient of lattice steel structures Cxt	0.8		IEC 60826
0.7.7	Drag coefficient of the conductor Cxc	1		IEC 60826
0.7.8	Drag coefficient of the insulator Cxi	1.2		IEC 60826

0.7.9	Deadweight γG Normal load (N1...Nn)	Compression 1,2 Uplift 0,9		
0.7.10	Deadweight γG Exceptional load (E1....En)	Compression 1,2 Uplift 0,9		
0.7.11	Wind γW Normal load (N1.....Nn)	1.3		
0.7.12	Wind γW Exceptional load (E1....En)	1		
0.7.13	Conductor tension γC Normal load (N1.....Nn)	1.3		
0.7.14	Conductor tension γC Exeptional load (E1....En)	1		
0.7.15	Construction/Maintenance γP Exceptional load (E1.....En)	1.5		
0.7.16	Strength factor steel members suspension towers γM	1.25		
0.7.17	Strength factor steel members angle/tension towers γM	1.25		
0.7.18	Strength factor steel bolts of tower connections γM	1.25		
0.7.19	Load Factors:			
0.7.20	Initial tension at min temperature (-1°C) & no wind pressure ACSR/OPGW/OHGW	40/40/40		% of UTS
0.7.21	Max tension at every day temperature (25°C) & no wind pressure ACSR/OPGW/OHGW	20/20/20		% of UTS
0.7.22	Initial tension at min temperature (-1°C) & full wind pressure ASC/OPGW/OHGW	40/40/40		% of UTS
0.7.23	Max tension at every day temperature (15°C) & full wind pressure ASC/OPGW/OHGW	40/40/40		% of UTS
0.7.24	Foundation Load Factors:			
0.7.25	Concrete	1.5		
0.7.26	Reinforcing steel	1.2		
0.7.27	Conductors and earthwires under maintenance load conditions	1.6		
0.7.28	Soil property at suspension towers	2		
0.7.29	Soil property at angle towers	2.2		
0.7.30	Safety Factors:			
0.7.31	Lattice Steel Towers:			
0.7.32	<u>Worst normal condition</u>			
0.7.33	Vertical	1.5		Factor
0.7.34	Transverse	1.5		Factor
0.7.35	Longitudinal	1.5		Factor
0.7.36	Construction and maintenance:			
0.7.37	Vertical	1.5		Factor
0.7.38	Transverse	1.5		Factor
0.7.39	Longitudinal	1.5		Factor
0.7.40	Insulators and Fittings:			
0.7.41	Worst normal condition	1.25		Factor
0.7.42	Construction and maintenance	1.25		Factor
0.7.43	Bare Conductors:			
0.7.44	Final sags calculated at temperature	+80		°C

0.8. Soil Investigations

Item	Description	ZTIP	Offered	Unit
0.8.1	Penetration equipment in accordance with the characteristic data as specified in the Technical Requirements, Soil Investigations; If other types, specify characteristic data.	SPT or DPL or CPT or other		

0.9. Cross-Border Stringing

Item	Description	Required	Offered	Unit
0.9.1	Cross-border stringing responsibility	Yes		Yes/No

Transmission Lines

1. Conductors and Cables

1.1. Conductor: ACSR Bluejay

Item	Description	Required	Offered	Unit
1.1.1	Manufacturer	Bidder to State		
1.1.2	Manufacturer's type and reference	Bidder to State		
1.1.3	Country of origin	Bidder to State		
1.1.4	Material	ACSR		
1.1.5	Standard	ASTM B232 / EN 50182		
1.1.6	Designation	ACSR Bluejay		
1.1.7	Cross-section total	604.39		mm ²
1.1.8	Cross-section area - Aluminium	563.93		mm ²
1.1.9	Cross-section area - Steel	39.03		mm ²
1.1.10	Overall diameter	31.98		mm
1.1.11	Stranding	45 / 7		nos
1.1.12	Diameter aluminium / steel wires	4,0 / 2,66		mm
1.1.13	Rated strength	132.63		kN
1.1.14	Rated DC resistance at 20°C	0.05136		Ω/km
1.1.15	Final Modulus of Elasticity	66600		N/mm ²
1.1.16	Coefficient of Linear Thermal Expansion	21.12		10 ⁻⁶ /°C
1.1.17	Weight	1868		kg/km
1.1.18	Guaranteed continuous current @ 85°C - Twin bundle	Bidder to State		A
1.1.19	Thermal-rating assumptions used (ambient temp, wind speed & direction, solar radiation, surface emissivity & absorptivity; method e.g., IEEE 738)	Bidder to State		

1.2. Conductor: ACSR Bison

Item	Description	Required	Offered	Unit
1.2.1	Manufacturer	Bidder to State		
1.2.2	Manufacturer's type and reference	Bidder to State		
1.2.3	Country of origin	Bidder to State		
1.2.4	Material	ACSR		
1.2.5	Standard	ASTM B232 / B232M, EN 50182		
1.2.6	Designation	ACSR Bison		
1.2.7	Cross-section total	431.2		mm ²
1.2.8	Cross-section area - Aluminium	381.7		mm ²
1.2.9	Cross-section area - Steel	49.5		mm ²
1.2.10	Overall diameter	27		mm
1.2.11	Stranding	54 / 7		nos
1.2.12	Diameter aluminium / steel wires	3.0 / 3.0		mm
1.2.13	Rated strength	120.9		kN
1.2.14	Rated DC resistance at 20°C	0.07573		Ω/km
1.2.15	Final Modulus of Elasticity	68650		N/mm ²
1.2.16	Coefficient of linear thermal expansion	19.3		10 ⁻⁶ /°C
1.2.17	Weight	1444		kg/km
1.2.18	Guaranteed continuous current @ 80°C - Twin bundle	Bidder to State		A
1.2.19	Thermal-rating assumptions used (ambient temp, wind speed & direction, solar radiation, surface emissivity & absorptivity; method e.g., IEEE 738)	Bidder to State		

1.3. Conductor: ACSR Wolf

Item	Description	Required	Offered	Unit
1.3.1	Manufacturer	Bidder to State		
1.3.2	Manufacturer's type and reference	Bidder to State		
1.3.3	Country of origin	Bidder to State		
1.3.4	Material	ACSR		
1.3.5	Standard	BS 215, EN 50182		
1.3.6	Designation	ACSR Wolf		
1.3.7	Cross-section total	194.94		mm ²
1.3.8	Cross-section area - Aluminium	158.06		mm ²
1.3.9	Cross-section area - Steel	36.88		mm ²
1.3.10	Overall diameter	18.13		mm
1.3.11	Stranding	30 / 7		nos
1.3.12	Diameter aluminium / steel wires	2,59 / 2,59		mm

1.3.13	Rated strength	69.2		kN
1.3.14	Rated DC resistance at 20°C	0.1828		Ω/km
1.3.15	Final Modulus of Elasticity	83400		N/mm ²
1.3.16	Coefficient of linear thermal expansion	18.43		10 ⁻⁶ /°C
1.3.17	Weight	727		kg/km
1.3.18	Guaranteed continuous current @ 75°C - Single	Bidder to State		A
1.3.19	Thermal-rating assumptions used (ambient temp, wind speed & direction, solar radiation, surface emissivity & absorptivity; method e.g., IEEE 738)	Bidder to State		

1.4. **Optical Ground Wire (OPGW) 400kV**

Item	Description	Required	Offered	Unit
1.4.1	Manufacturer	Bidder to State		
1.4.2	Manufacturer's type and reference	Bidder to State		
1.4.3	Country of origin	Bidder to State		
1.4.4	Description	Ribbon slotted core		
1.4.5	Standards	EN 187000; EN 187100; EN 187101; EN 188000; EN 188100; IEC 60793; IEC 60794		
1.4.6	Optical Characteristic			
1.4.7	Lightning Class (IEEE 1138)	Class 2		
1.4.8	Classification of fibres	ITU-TG.652D, ITU-TG.655		
1.4.9	Number of fibres	48 (24 + 24)		nos
1.4.10	Mode	Dual Window single mode		
1.4.11	Optimized wavelength	1550 / 1310		nm
1.4.12	Longitudinal water block	Polymeric filling compound		
1.4.13	Reinforcement member	Fiber glass		
1.4.14	Halogen free	Yes		
1.4.15	Maximum pulling force	>2,5		kN
1.4.16	Nominal permanent tensile strength	>1,5		kN
1.4.17	Polarisation mode dispersion	<0,2		ps/Vkm
1.4.18	Maximum attenuation coefficient at 1310nm	0.36		db/km
1.4.19	Maximum attenuation coefficient at 1550nm	0.22		db/km
1.4.20	Cable termination	Heat shrink		
1.4.21	Chromatic dispersion	<=3.5 ps/(nm.km) @1228-1399 nm <6.0 ps/(nm.km) @1550 nm		
1.4.22	Cut-off Wave Length	1100-1280 nm (measured on 2 m fibre)		
1.4.23	Mechanical/Electrical Characteristics			
1.4.24	Type of OPGW	OPGW shall comply with IEC 60794-4-1 and shall meet or exceed RTS, unit weight, and current-carrying duty equivalent to the specified earth wire class. Bidder to submit mechanical / thermal data sheets and stringing charts		
1.4.25	Overall diameter	Bidder to state		mm
1.4.26	Mass (dry)	Bidder to State		kg/km
1.4.27	Ultimate tensile strength	118		kN
1.4.28	Modulus of elasticity	≥96400		N/mm2
1.4.29	DC resistance at 20°C	≤0.2992		Ohms/km
1.4.30	Coefficient of linear thermal expansion	≤17.1		10-6/°C
1.4.31	Fault current capacity (20°C – 160°C) at 0.2s	≥200		kA²s
1.4.32	Short circuit current	31.5		kA
1.4.33	Minimum delivery length per drum	4		km
1.4.34	Normal temperature range	-10...80		°C
1.4.35	Maximum temperature < 1.0 second	180		°C
1.4.36	Min recommended stringing block diameter.	≥ 40xD(OPGW)		mm
1.4.37	Permanent bend radius	≥ 15xD(OPGW		mm
1.4.38	Max stringing tension	≤ 20% Rated Breaking Strength		
1.4.39	Metallic armoring	Yes		
1.4.40	Min recommended stringing block diameter.	≥ 40xD(OPGW)		mm
1.4.41	Permanent bend radius	≥ 15xD(OPGW		mm
1.4.42	Max stringing tension	≤ 20% Rated Breaking Strength		
1.4.43	Metallic armoring	Yes		
1.4.44	Minimum design life with fatigue requirement	40		year

1.5. Optical Ground Wire (OPGW) 330kV & 132kV

Item	Description	Required	Offered	Unit
1.5.1	Manufacturer	Bidder to State		
1.5.2	Manufacturer's type and reference	Bidder to State		
1.5.3	Country of origin	Bidder to State		
1.5.4	Description	Ribbon slotted core		
1.5.5	Standards	EN 187000; EN 187100; EN 187101; EN 188000; EN 188100; IEC 60793; IEC 60794		
1.5.6	Optical Characteristics			
1.5.7	Lightning Class (IEEE 1138)	Class 2		
1.5.8	Classification of fibres	ITU-TG.652D		
1.5.9	Number of fibres	48		nos
1.5.10	Mode	Dual Window single mode		
1.5.11	Optimized wavelength	1550 / 1310		nm
1.5.12	Longitudinal water block	Polymeric filling compound		
1.5.13	Reinforcement member	Fiber glass		
1.5.14	Halogen free	Yes		
1.5.15	Metal free	Yes		
1.5.16	Maximum pulling force	>2,5		kN
1.5.17	Nominal permanent tensile strength	>1,5		kN
1.5.18	Polarisation mode dispersion	=<0,2		ps/Vkm
1.5.19	Maximum attenuation coefficient at 1310nm	0.36		db/km
1.5.20	Maximum attenuation coefficient at 1550nm	0.22		db/km
1.5.21	Cable termination	Heat shrink		
1.5.22	Chromatic dispersion	<=3.5 ps/(nm.km) @1228- 1399 nm <6.0 ps/(nm.km) @1550 nm		
1.5.23	Cut-off Wave Length	1100-1280 nm (measured on 2 m fibre)		
1.5.24	Mechanical/Electrical Characteristics			
1.5.25	Type of OPGW	OPGW shall comply with IEC 60794-4-1 and shall meet or exceed RTS, unit weight, and current-carrying duty equivalent to the specified earth wire class. Bidder to submit mechanical / thermal data sheets and stringing charts.		
1.5.26	Overall diameter	Bidder to State		mm
1.5.27	Mass (dry)	Bidder to State		kg/km
1.5.28	Ultimate tensile strength	≥105		kN
1.5.29	Modulus of elasticity	≥96400		N/mm²
1.5.30	DC resistance at 20°C	≤0.258		Ohms/km
1.5.31	Coefficient of linear thermal expansion	≤17.1		10 ⁻⁶ /°C
1.5.32	Fault current capacity (20°C – 160°C) at 0.2s	≥200		kA²s
1.5.33	Short circuit current	31.5		kA
1.5.34	Minimum delivery length per drum	4		km
1.5.35	Normal temperature range	-10...80		°C
1.5.36	Maximum temperature < 1.0 second	180		°C
1.5.37	Min recommended stringing block diameter.	≥ 40xD(OPGW)		mm
1.5.38	Permanent bend radius	≥ 15xD(OPGW		mm
1.5.39	Max stringing tension	≤ 20% Rated Breaking Strength		
1.5.40	Metallic armoring	Yes		
1.5.41	Minimum design life with fatigue requirement	40		year

1.6. ADSS Optical Fibre Cable

Item	Description	Required	Offered	Unit
1.6.1	Manufacturer	Bidder to State		
1.6.2	Manufacturer's type and reference	Bidder to State		
1.6.3	Country of origin	Bidder to State		
1.6.4	Standards	EN 187000; EN 187100; EN 187101; EN 188000; EN 188100; IEC 60793; IEC 60794		
1.6.5	Classification of Fibre	ITU-T G652D		

1.6.6	Number of Fibres	48		nos
1.6.7	Tubes / Fibres	4 / 12		nos
1.6.8	Colour coding of Tubes	Blue, Orange, Green, Brown		
1.6.9	Colour coding of Fibre	Blue, Orange, Green, Brown, Grey, White, Red, Black, Yellow, Violet, Rose, Aqua		
1.6.10	Max Span Length	600		m
1.6.11	Cable diameter	13.8		mm
1.6.12	Cable Weight AT	176		kg/km
1.6.13	Rated Tensile Strength (RTS)	≥ 50		kN
1.6.14	Maximum allowable tension (40% RTS)	≥ 18		kN
1.6.15	Outer sheath thickness	2.0		mm
1.6.16	Inner Sheath thickness	1.0		mm
1.6.17	Installation Temperature	-10 ~ +60		°C
1.6.18	Transportation and Operation Temperature	-40 ~ +80		°C
1.6.19	Optical Characteristics			
1.6.20	Cable Type / Mode	Single mode 9/125um		
1.6.21	Fibre Type	ITU-T G652D		
1.6.22	Optimized wavelength	1550 / 1310		nm
1.6.23	Polarisation mode dispersion (PMD)	≤ 0,12		µm
1.6.24	Mechanical Proof Test	>0,69		GPa
1.6.25	Nominal permanent tensile strength	>1,5		kN
1.6.26	Attenuation coefficient at 1310nm	≤0,30		dB/km
1.6.27	Attenuation coefficient at 1550nm	≤0,20		dB/km
1.6.28	Temperature Cycling Induced Attenuation at 1559nm (-60°C to +85°C)	0.05		dB/km
1.6.29	Macro bending loss; at 1550nm (100 turns; Ø 50mm)	≤0,05		dB

1.7. Optical Ground Wire Splice Box (400kV)

Item	Description	Required	Offered	Unit
1.7.1	Manufacturer	to be specified		
1.7.2	Manufacturer's type and reference	to be specified		
1.7.3	Country of origin	to be specified		
1.7.4	Description	Joint box and Terminal box		
1.7.5	Standard specification applied	IEC, EN		
1.7.6	Material	Stainless steel / INOX		
1.7.7	Degree of protection	IP67		
1.7.8	Number of spliced fibres that can be accomodated	48		nos
1.7.9	Classification of fibres	ITU-TG.652D, ITU-TG.655		
1.7.10	Number of fibres	48 (24 + 24)		nos
1.7.11	Length of cable or wire that can be accomodated	12		m
1.7.12	Bullet proof	Yes		

1.8. Optical Ground Wire Splice Box (330kV & 132kV)

Item	Description	Required	Offered	Unit
1.8.1	Manufacturer	to be specified		
1.8.2	Manufacturer's type and reference	to be specified		
1.8.3	Country of origin	to be specified		
1.8.4	Description	Joint box and Terminal box		
1.8.5	Standard specification applied	IEC, EN		
1.8.6	Material	Stainless steel / INOX		
1.8.7	Degree of protection	IP67		
1.8.8	Number of spliced fibres that can be accomodated	48		nos
1.8.9	Classification of fibres	ITU-TG.652D		
1.8.10	Number of fibres	48		nos
1.8.11	Length of cable or wire that can be accomodated	12		m
1.8.12	Bullet proof	Yes		

1.9. Overhead Ground Wire / Shield Wire (OHGW) 400kV

Item	Description	Required	Offered	Unit
1.9.1	Manufacturer	to be specified		
1.9.2	Manufacturer's type and reference	to be specified		
1.9.3	Country of origin	to be specified		
1.9.4	Description	ACSR 95/55		
1.9.5	Standard	EN 50182		

1.9.6	Minimum UTS	80.2		kN
1.9.7	Total cross section	152.8		mm ²
1.9.8	Number of wires	12 / 7		nos
1.9.9	Wire diameter	3.2		mm
1.9.10	Overall diameter	18		mm
1.9.11	Ultimate tensile strength	77.8		kN
1.9.12	Modulus of elasticity	107000		N/mm ²
1.9.13	Coefficient of linear thermal expansion	15.3		10 ⁻⁶ /°C
1.9.14	DC resistance at 20°C	0.2992		Ohms/km
1.9.15	Weight	700		kg/km

1.10. Overhead Ground Wire / Shield Wire (OHGW) 330kV

Item	Description	Required	Offered	Unit
1.10.1	Manufacturer	to be specified		
1.10.2	Manufacturer's type and reference	to be specified		
1.10.3	Country of origin	to be specified		
1.10.4	Description	ACS 7/6 AWG		
1.10.5	Standard	ASTM B415, ASTM B416		
1.10.6	Minimum UTS	101		kN
1.10.7	Total cross section	93.1		mm ²
1.10.8	Number of wires	7		nos
1.10.9	Wire diameter	4.11		mm
1.10.10	Overall diameter	12.3		mm
1.10.11	Ultimate tensile strength	101.14		kN
1.10.12	Modulus of elasticity	158620		N/mm ²
1.10.13	Coefficient of linear thermal expansion	13		10 ⁻⁶ /°C
1.10.14	DC resistance at 20°C (ACS Class ~20% IACS)	0.922		Ohms/km
1.10.15	Weight	619		kg/km

2.

Civil

2.1.

Gabions for erosion protection

Item	Description	Required	Offered	Unit
2.1.1	Description	Welded gabions		-
2.1.2	Wire, Hard Drawn Steel, Electrically Welded	4		mm
2.1.3	Weld mesh aperture	75x75		mm
2.1.4	Size	1x1x2		m
2.1.5	Life Time	>50		years

2.2.

Gravelled Access road

Item	Description	Required	Offered	Unit
2.2.1	Clearing the road	5		m wide
2.2.2	Clearing the road	20		km length
2.2.3	Gravelling road with of at least 200 mm depth, 5 m wide	20		km length
2.2.4	[Deleted]			

Transmission Lines

3. Lattice Steel Towers

3.1. Tower Members

Item	Description	Required	Offered	Unit
3.1.1	Equipment fulfils requirement set in sheet " 0 General ", Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.1.2	Manufacturer	to be specified by bidder		
3.1.3	Manufacturer's type and reference	to be specified by bidder		
3.1.4	Country of origin	to be specified by bidder		
3.1.5	Description	to be specified by bidder		
3.1.6	Standard to be applied for the steel of tower members	EN 10025, S355JO, S235JR		
3.1.7	Standard to be applied for galvanising of tower members	ISO 1461		

3.2. Bolts, Nuts and Washers

Item	Description	Required	Offered	Unit
3.2.1	Manufacturer	to be specified by bidder		
3.2.2	Manufacturer's type and reference	to be specified by bidder		
3.2.3	Country of origin	to be specified by bidder		
3.2.4	Standard to be applied for bolts, nuts and washers	ASTM A394		
3.2.5	Bolt connections secured with Flat washer and spring washer	yes		
3.2.6	Permissible Stress of Structural Member , Bolts & Nuts corresponding with	Standard-EN 1993-1-1 EN 50341-1-J		
3.2.7	Standard to be applied for galvanising of bolts, nuts and washers	ASTM A123, ASTM A153, ASTM A385		
3.2.8	Bolt connections secured with washers and spring	yes		
3.2.9	All tower steel parts hot dip galvanized	yes		
3.2.10	Zinc coat: for steel sections	85		µm
3.2.11	for bolts and nuts	55		µm
3.2.12	Quality and tests correspond with	ASTM A370		
3.2.13	Maximum slenderness ratio - L/r:			
3.2.14	• Main leg, stub and main compression members in crossarm	120		λ
3.2.15	• All other members having computed stresses	200		λ
3.2.16	• Redundant members without computed stressed	250		λ
3.2.17	• Tension members only	300		λ
3.2.18	Minimum thickness (t) and size of steel members of towers shall be as follows:			
3.2.19	• Main leg, stub and main compression members in crossarms	6		mm
3.2.20	• All other members having computed stresses	5		mm
3.2.21	• Redundant members without computed stressed	5		mm
3.2.22	• Gusset plates	6		mm
3.2.23	Maximum length of structural member	12		m
3.2.24	Tolerances of finished members:			
3.2.25	• Max. lateral variations of actual length between points of lateral supports ratio	1/1000		ratio

3.3. Lattice Steel Towers: Suspension tower 400DA (0° - 2° angle)

Item	Description	Required	Offered	Unit
3.3.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.3.2	Manufacturer	to be specified		
3.3.3	Manufacturer's type and reference	to be specified		
3.3.4	Country of origin	to be specified		
3.3.5	Description	Suspension tower (0° to 2° angle)		
3.3.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.3.7	Maximum angle of deviation (°)	2		degrees
3.3.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.3.9	Overall basic tower height	to be specified		m
3.3.10	Horizontal spacing between conductors	to be specified		m
3.3.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.3.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.3.13	Vertical spacing between conductors	to be specified		m
3.3.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.3.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m

3.3.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.4. Lattice Steel Towers: Angle tension tower 400DB (0°- 10° angle)

Item	Description	Required	Offered	Unit
3.4.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.4.2	Manufacturer	to be specified		
3.4.3	Manufacturer's type and reference	to be specified		
3.4.4	Country of origin	to be specified		
3.4.5	Description	Angle tension tower (0° to 10° angle)		
3.4.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.4.7	Maximum angle of deviation (°)	10		degrees
3.4.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.4.9	Overall basic tower height	to be specified		m
3.4.10	Horizontal spacing between conductors	to be specified		m
3.4.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.4.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.4.13	Vertical spacing between conductors	to be specified		m
3.4.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.4.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.4.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.5. Lattice Steel Towers: Angle tension tower 400DC (10° - 30° angle)

Item	Description	Required	Offered	Unit
3.5.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.5.2	Manufacturer	to be specified		
3.5.3	Manufacturer's type and reference	to be specified		
3.5.4	Country of origin	to be specified		
3.5.5	Description	Angle tension tower (10° to 30° angle)		
3.5.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.5.7	Maximum angle of deviation (°)	30		degrees
3.5.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.5.9	Overall basic tower height	to be specified		m
3.5.10	Horizontal spacing between conductors	to be specified		m
3.5.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.5.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.5.13	Vertical spacing between conductors	to be specified		m
3.5.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.5.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.5.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.6. Lattice Steel Towers: Angle tension tower 400DD (30° - 60° angle)

Item	Description	Required	Offered	Unit
3.6.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.6.2	Manufacturer	to be specified		
3.6.3	Manufacturer's type and reference	to be specified		
3.6.4	Country of origin	to be specified		
3.6.5	Description	Angle tension tower (30° to 60° angle)		
3.6.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.6.7	Maximum angle of deviation (°)	60		degrees
3.6.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.6.9	Overall basic tower height	to be specified		m
3.6.10	Horizontal spacing between conductors	to be specified		m
3.6.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.6.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.6.13	Vertical spacing between conductors	to be specified		m
3.6.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m

3.6.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.6.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.7. Lattice Steel Towers: Angle tension tower 400DE (60° - 90° angle)

Item	Description	Required	Offered	Unit
3.7.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.7.2	Manufacturer	to be specified		
3.7.3	Manufacturer's type and reference	to be specified		
3.7.4	Country of origin	to be specified		
3.7.5	Description	Angle tension tower (60° to 90° angle)		
3.7.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.7.7	Maximum angle of deviation (°)	90		degrees
3.7.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.7.9	Overall basic tower height	to be specified		m
3.7.10	Horizontal spacing between conductors	to be specified		m
3.7.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.7.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.7.13	Vertical spacing between conductors	to be specified		m
3.7.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.7.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.7.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.8. Lattice Steel Towers: Terminal tension tower 400DET (0° - 45° Entry & Exit)

Item	Description	Required	Offered	Unit
3.8.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.8.2	Manufacturer	to be specified		
3.8.3	Manufacturer's type and reference	to be specified		
3.8.4	Country of origin	to be specified		
3.8.5	Description	Terminal tension tower (0° - 45° Entry & Exit, 45° D/lead fallaway)		
3.8.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.8.7	Maximum angle of deviation (°)	45		degrees
3.8.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.8.9	Overall basic tower height	to be specified		m
3.8.10	Horizontal spacing between conductors	to be specified		m
3.8.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.8.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.8.13	Vertical spacing between conductors	to be specified		m
3.8.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.8.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.8.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.9. Lattice Steel Towers: Suspension tower 330DA (0° - 2° angle)

Item	Description	Required	Offered	Unit
3.9.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.9.2	Manufacturer	to be specified		
3.9.3	Manufacturer's type and reference	to be specified		
3.9.4	Country of origin	to be specified		
3.9.5	Description	Suspension tower (0° to 2° angle)		
3.9.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.9.7	Maximum angle of deviation (°)	2		degrees
3.9.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.9.9	Overall basic tower height	to be specified		m
3.9.10	Horizontal spacing between conductors	to be specified		m
3.9.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m

3.9.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.9.13	Vertical spacing between conductors	to be specified		m
3.9.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.9.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.9.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.10. Lattice Steel Towers: Angle / Anti-cascading tower 330DB (0° - 10° angle)

Item	Description	Required	Offered	Unit
3.10.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.10.2	Manufacturer	to be specified		
3.10.3	Manufacturer's type and reference	to be specified		
3.10.4	Country of origin	to be specified		
3.10.5	Description	Angle/anti-cascading tower (0° to 10° angle)		
3.10.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.10.7	Maximum angle of deviation (°)	10		degrees
3.10.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.10.9	Overall basic tower height	to be specified		m
3.10.10	Horizontal spacing between conductors	to be specified		m
3.10.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.10.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.10.13	Vertical spacing between conductors	to be specified		m
3.10.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.10.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.10.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.11. Lattice Steel Towers: Angle tension tower 330DC (10° - 30° angle)

Item	Description	Required	Offered	Unit
3.11.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.11.2	Manufacturer	to be specified		
3.11.3	Manufacturer's type and reference	to be specified		
3.11.4	Country of origin	to be specified		
3.11.5	Description	Angle tension tower (10° to 30° angle)		
3.11.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.11.7	Maximum angle of deviation (°)	30		degrees
3.11.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.11.9	Overall basic tower height	to be specified		m
3.11.10	Horizontal spacing between conductors	to be specified		m
3.11.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.11.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.11.13	Vertical spacing between conductors	to be specified		m
3.11.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.11.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.11.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.12. Lattice Steel Towers: Angle tension tower 330DD (30° - 60° angle)

Item	Description	Required	Offered	Unit
3.12.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.12.2	Manufacturer	to be specified		
3.12.3	Manufacturer's type and reference	to be specified		
3.12.4	Country of origin	to be specified		
3.12.5	Description	Angle tension tower (30° to 60° angle)		
3.12.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.12.7	Maximum angle of deviation (°)	60		degrees
3.12.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.12.9	Overall basic tower height	to be specified		m
3.12.10	Horizontal spacing between conductors	to be specified		m

3.12.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.12.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.12.13	Vertical spacing between conductors	to be specified		m
3.12.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.12.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.12.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.13. Lattice Steel Towers: Angle tension tower 330DE (60° - 90° angle)

Item	Description	Required	Offered	Unit
3.13.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.13.2	Manufacturer	to be specified		
3.13.3	Manufacturer's type and reference	to be specified		
3.13.4	Country of origin	to be specified		
3.13.5	Description	Angle tension tower (60° to 90° angle)		
3.13.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.13.7	Maximum angle of deviation (°)	90		degrees
3.13.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.13.9	Overall basic tower height	to be specified		m
3.13.10	Horizontal spacing between conductors	to be specified		m
3.13.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.13.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.13.13	Vertical spacing between conductors	to be specified		m
3.13.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.13.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.13.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.14. Lattice Steel Towers: Terminal tension tower 330DET (0° - 45° Entry & Exit)

Item	Description	Required	Offered	Unit
3.14.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.14.2	Manufacturer	to be specified		
3.14.3	Manufacturer's type and reference	to be specified		
3.14.4	Country of origin	to be specified		
3.14.5	Description	Terminal tension tower (0° to 45° Entry & Exit, 45° D/lead fallaway)		
3.14.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.14.7	Maximum angle of deviation (°)	45		degrees
3.14.8	Height of earth-wire / OPGW above conductor	to be specified		m
3.14.9	Overall basic tower height	to be specified		m
3.14.10	Horizontal spacing between conductors	to be specified		m
3.14.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.14.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.14.13	Vertical spacing between conductors	to be specified		m
3.14.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.14.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.14.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.15. Lattice Steel Towers: Transposition tower 330DT (0° - 10°)

Item	Description	Required	Offered	Unit
3.15.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.15.2	Manufacturer	to be specified		
3.15.3	Manufacturer's type and reference	to be specified		
3.15.4	Country of origin	to be specified		
3.15.5	Description	Transposition tower (0° - 10°)		
3.15.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.15.7	Maximum angle of deviation (°)	10		degrees
3.15.8	Height of earth-wire / OPGW above conductor	to be specified		m

3.15.9	Overall basic tower height	to be specified		m
3.15.10	Horizontal spacing between conductors	to be specified		m
3.15.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.15.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.15.13	Vertical spacing between conductors	to be specified		m
3.15.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.15.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.15.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.16 [Deleted]

3.17. Lattice Steel Towers: Suspension tower 132DA (0° - 2°)

Item	Description	Required	Offered	Unit
3.17.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.17.2	Manufacturer	to be specified		
3.17.3	Manufacturer's type and reference	to be specified		
3.17.4	Country of origin	to be specified		
3.17.5	Description	Suspension tower (0° - 2°)		
3.17.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.17.7	Maximum angle of deviation (°)	2		degrees
3.17.8	Height of OPGW above conductor	to be specified		m
3.17.9	Overall basic tower height	to be specified		m
3.17.10	Horizontal spacing between conductors	to be specified		m
3.17.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.17.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.17.13	Vertical spacing between conductors	to be specified		m
3.17.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.17.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.17.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.18. Lattice Steel Towers: Angle tension tower 132DB (0° - 30°)

Item	Description	Required	Offered	Unit
3.18.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.18.2	Manufacturer	to be specified		
3.18.3	Manufacturer's type and reference	to be specified		
3.18.4	Country of origin	to be specified		
3.18.5	Description	Angle tension tower (0° to 30°)		
3.18.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.18.7	Maximum angle of deviation (°)	30		degrees
3.18.8	Height of OPGW above conductor	to be specified		m
3.18.9	Overall basic tower height	to be specified		m
3.18.10	Horizontal spacing between conductors	to be specified		m
3.18.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.18.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.18.13	Vertical spacing between conductors	to be specified		m
3.18.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.18.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.18.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.19. Lattice Steel Towers: Angle tension tower 132DC (30° - 60°)

Item	Description	Required	Offered	Unit
3.19.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.19.2	Manufacturer	to be specified		
3.19.3	Manufacturer's type and reference	to be specified		
3.19.4	Country of origin	to be specified		
3.19.5	Description	Angle tension tower (30° to 60°)		

3.19.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.19.7	Maximum angle of deviation (°)	60		degrees
3.19.8	Height of OPGW above conductor	to be specified		m
3.19.9	Overall basic tower height	to be specified		m
3.19.10	Horizontal spacing between conductors	to be specified		m
3.19.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.19.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.19.13	Vertical spacing between conductors	to be specified		m
3.19.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.19.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.19.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.20. Lattice Steel Towers: Angle tension tower 132DD (60° - 90°)

Item	Description	Required	Offered	Unit
3.20.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.20.2	Manufacturer	to be specified		
3.20.3	Manufacturer's type and reference	to be specified		
3.20.4	Country of origin	to be specified		
3.20.5	Description	Angle tension tower (60° - 90°)		
3.20.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.20.7	Maximum angle of deviation (°)	90		degrees
3.20.8	Height of OPGW above conductor	to be specified		m
3.20.9	Overall basic tower height	to be specified		m
3.20.10	Horizontal spacing between conductors	to be specified		m
3.20.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.20.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.20.13	Vertical spacing between conductors	to be specified		m
3.20.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.20.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.20.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.21. Lattice Steel Towers: Terminal tension tower 132DET (0° - 45° Entry & Exit 45°)

Item	Description	Required	Offered	Unit
3.21.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.21.2	Manufacturer	to be specified		
3.21.3	Manufacturer's type and reference	to be specified		
3.21.4	Country of origin	to be specified		
3.21.5	Description	Terminal tension tower (0° to 45° Entry & Exit, 45° D/lead fallaway)		
3.21.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.21.7	Maximum angle of deviation (°)	45		degrees
3.21.8	Height of OPGW above conductor	to be specified		m
3.21.9	Overall basic tower height	to be specified		m
3.21.10	Horizontal spacing between conductors	to be specified		m
3.21.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.21.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.21.13	Vertical spacing between conductors	to be specified		m
3.21.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.21.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.21.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.22. Lattice Steel Towers: Angle tension tower 132SPEC (90° + 90° angle)

Item	Description	Required	Offered	Unit
3.22.1	Equipment fulfils requirement set in Climate Conditions schedule 0.1 and Main Design Data schedule 0.2	Yes		
3.22.2	Manufacturer	to be specified		

3.22.3	Manufacturer's type and reference	to be specified		
3.22.4	Country of origin	to be specified		
3.22.5	Description	Angle tension tower (90° + 90°)		
3.22.6	Standard specification applied	EN 1993, Eurocode 3 ANSI/ ASCE/SEI 10-15		
3.22.7	Maximum angle of deviation (°)	90		degrees
3.22.8	Height of OPGW above conductor	to be specified		m
3.22.9	Overall basic tower height	to be specified		m
3.22.10	Horizontal spacing between conductors	to be specified		m
3.22.11	Horizontal distance from tower center line to outer insulator attachment	to be specified		m
3.22.12	Horizontal distance from tower center line to earth-wire attachment	to be specified		m
3.22.13	Vertical spacing between conductors	to be specified		m
3.22.14	Vertical distance from tower center line to outer insulator attachment	to be specified		m
3.22.15	Vertical distance from tower center line to earth-wire attachment	to be specified		m
3.22.16	Mass of complete tower with body extension and maximum leg extensions	to be specified		kg

3.23. Lattice Steel Towers: 400kV - Leg and Body Extensions

Item	Description	Required	Offered	Unit
3.23.1	400kV DA Tower (0° to 2°), Body Extension	+3m, +6m, +9m, +12m, +15m		
3.23.2	400kV DA Tower (0° to 2°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.23.3	400kV DB Tower (0° to 10°), Body Extension	+3m, +6m, +9m, +12m, +15m		
3.23.4	400kV DB Tower (0° to 10°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.23.5	400kV DC Tower (10° to 30°), Body Extension	+3m, +6m, +9m, +12m		
3.23.6	400kV DC Tower (10° to 30°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.23.7	400kV DD Tower (30° to 60°), Body Extension	+3m, +6m, +9m, +12m		
3.23.8	400kV DD Tower (30° to 60°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.23.9	400kV DE Tower (60° to 90°), Body Extension	+3m, +6m, +9m, +12m		
3.23.10	400kV DE Tower (60° to 90°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.23.11	400kV DET Tower (0° to 45°), Body Extension	+3m, +6m, +9m		
3.23.12	400kV DET Tower (0° to 45°), Leg Extension	+1m, +2m, +3m, +4m, +5m		

3.24. Lattice Steel Towers: 330kV - Leg and Body Extensions

Item	Description	Required	Offered	Unit
3.24.1	330kV DA Tower (0° to 2°), Body Extension	+3m, +6m, +9m, +12m, +15m		
3.24.2	330kV DA Tower (0° to 2°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.24.3	330kV DB Tower (0° to 10°), Body Extension	+3m, +6m, +9m, +12m, +15m		
3.24.4	330kV DB Tower (0° to 10°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.24.5	330kV DC Tower (10° to 30°), Body Extension	+3m, +6m, +9m, +12m		
3.24.6	330kV DC Tower (10° to 30°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.24.7	330kV DD Tower (30° to 60°), Body Extension	+3m, +6m, +9m, +12m		
3.24.8	330kV DD Tower (30° to 60°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.24.9	330kV DE Tower (60° to 90°), Body Extension	+3m, +6m, +9m, +12m		
3.24.10	330kV DE Tower (60° to 90°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.24.11	330kV DET Tower (0° to 45°), Body Extension	+3m, +6m, +9m		
3.24.12	330kV DET Tower (0° to 45°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.24.13	330kV DT Transposition Tower (0° to 10°), Body Extension	+3m, +6m		
3.24.14	330kV DT Transposition Tower (0° to 10°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.24.15	330kV DET Tower (0° to 45°), Body Extension	+3m, +6m, +9m		
3.24.16	330kV DET Tower (0° to 45°), Leg Extension	+1m, +2m, +3m, +4m, +5m		

3.25. Lattice Steel Towers: 132kV - Leg and Body Extensions

Item	Description	Required	Offered	Unit
3.25.1	132kV DA Tower (0° to 2°), Body Extension	+3m, +6m, +9m, +12m, +15m		
3.25.2	132kV DA Tower (0° to 2°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.25.3	132kV DB Tower (0° to 30°), Body Extension	+3m, +6m, +9m, +12m, +15m		
3.25.4	132kV DB Tower (0° to 30°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.25.5	132kV DC Tower (30° to 60°), Body Extension	+3m, +6m, +9m, +12m		
3.25.6	132kV DC Tower (30° to 60°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.25.7	132kV DD Tower (60° to 90°), Body Extension	+3m, +6m, +9m, +12m		
3.25.8	132kV DD Tower (60° to 90°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.25.9	132kV DET Tower (0° to 45°), Body Extension	+3m, +6m, +9m		

3.25.10	132kV DET Tower (0° to 45°), Leg Extension	+1m, +2m, +3m, +4m, +5m		
3.25.11	132kV SPEC Tower (90° + 90°), Body Extension	+3m, +6m, +9m		
3.25.12	132kV SPEC Tower (90° + 90°), Leg Extension	+1m, +2m, +3m, +4m, +5m		

3.26 Estimated Weight of 330kV Tower

Item	Description	Required	Offered	Unit
3.26.1	330kV DA Tower			
3.26.1.1	Standard height tower (including 0m leg)	to be specified		tonne
3.26.1.2	+3.0 m body extension	to be specified		tonne
3.26.1.3	+6.0 m body extension	to be specified		tonne
3.26.1.4	+9.0 m body extension	to be specified		tonne
3.26.1.5	+12.0 m body extension	to be specified		tonne
3.26.1.6	+15.0 m body extension	to be specified		tonne
3.26.1.7	+1 m leg extension (extra over)	to be specified		tonne/leg
3.26.1.8	+2 m leg extension (extra over)	to be specified		tonne/leg
3.26.1.9	+3 m leg extension (extra over)	to be specified		tonne/leg
3.26.1.10	+4 m leg extension (extra over)	to be specified		tonne/leg
3.26.1.11	+5 m leg extension (extra over)	to be specified		tonne/leg
3.26.2	330kV DB Tower			
3.26.2.1	Standard height tower (including 0m leg)	to be specified		tonne
3.26.2.2	+3.0 m body extension	to be specified		tonne
3.26.2.3	+6.0 m body extension	to be specified		tonne
3.26.2.4	+9.0 m body extension	to be specified		tonne
3.26.2.5	+12.0 m body extension	to be specified		tonne
3.26.2.6	+15.0 m body extension	to be specified		tonne
3.26.2.7	+1 m leg extension (extra over)	to be specified		tonne/leg
3.26.2.8	+2 m leg extension (extra over)	to be specified		tonne/leg
3.26.2.9	+3 m leg extension (extra over)	to be specified		tonne/leg
3.26.2.10	+4 m leg extension (extra over)	to be specified		tonne/leg
3.26.2.11	+5 m leg extension (extra over)	to be specified		tonne/leg
3.26.3	330kV DC Tower			
3.26.3.1	Standard height tower (including 0m leg)	to be specified		tonne
3.26.3.2	+3.0 m body extension	to be specified		tonne
3.26.3.3	+6.0 m body extension	to be specified		tonne
3.26.3.4	+9.0 m body extension	to be specified		tonne
3.26.3.5	+12.0 m body extension	to be specified		tonne
3.26.3.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.26.3.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.26.3.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.26.3.9	+4 m leg extension (extra over)	to be specified		tonne/leg
3.26.3.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.26.4	330kV DD Tower			
3.26.4.1	Standard height tower (including 0m leg)	to be specified		tonne
3.26.4.2	+3.0 m body extension	to be specified		tonne
3.26.4.3	+6.0 m body extension	to be specified		tonne
3.26.4.4	+9.0 m body extension	to be specified		tonne
3.26.4.5	+12.0 m body extension	to be specified		tonne
3.26.4.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.26.4.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.26.4.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.26.4.9	+4 m leg extension (extra over)	to be specified		tonne/leg
3.26.4.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.26.5	330kV DE Tower			
3.26.5.1	Standard height tower (including 0m leg)	to be specified		tonne
3.26.5.2	+3.0 m body extension	to be specified		tonne
3.26.5.3	+6.0 m body extension	to be specified		tonne
3.26.5.4	+9.0 m body extension	to be specified		tonne
3.26.5.5	+12.0 m body extension	to be specified		tonne
3.26.5.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.26.5.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.26.5.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.26.5.9	+4 m leg extension (extra over)	to be specified		tonne/leg
3.26.5.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.26.6	330kV DET Tower			
3.26.6.1	Standard height tower (including 0m leg)	to be specified		tonne

3.26.6.2	+3.0 m body extension	to be specified		tonne
3.26.6.3	+6.0 m body extension	to be specified		tonne
3.26.6.4	+9.0 m body extension	to be specified		tonne
3.26.6.5	+1 m leg extension (extra over)	to be specified		tonne/leg
3.26.6.6	+2 m leg extension (extra over)	to be specified		tonne/leg
3.26.6.7	+3 m leg extension (extra over)	to be specified		tonne/leg
3.26.6.8	+4 m leg extension (extra over)	to be specified		tonne/leg
3.26.6.9	+5 m leg extension (extra over)	to be specified		tonne/leg
3.26.7	330kV DT Transposition Tower			
3.26.7.1	Standard height tower (including 0m leg)	to be specified		tonne
3.26.7.2	+3.0 m body extension	to be specified		tonne
3.26.7.3	+6.0 m body extension	to be specified		tonne
3.26.7.4	+1 m leg extension (extra over)	to be specified		tonne/leg
3.26.7.5	+2 m leg extension (extra over)	to be specified		tonne/leg
3.26.7.6	+3 m leg extension (extra over)	to be specified		tonne/leg
3.26.7.7	+4 m leg extension (extra over)	to be specified		tonne/leg
3.26.7.8	+5 m leg extension (extra over)	to be specified		tonne/leg

3.27. Estimated Weight of 400kV Tower

Item	Description	Required	Offered	Unit
3.27.1	400kV DA Tower			
3.27.1.1	Standard height tower (including 0m leg)	to be specified		tonne
3.27.1.2	+3.0 m body extension	to be specified		tonne
3.27.1.3	+6.0 m body extension	to be specified		tonne
3.27.1.4	+9.0 m body extension	to be specified		tonne
3.27.1.5	+12.0 m body extension	to be specified		tonne
3.27.1.6	+15.0 m body extension	to be specified		tonne
3.27.1.7	+1 m leg extension (extra over)	to be specified		tonne/leg
3.27.1.8	+2 m leg extension (extra over)	to be specified		tonne/leg
3.27.1.9	+3 m leg extension (extra over)	to be specified		tonne/leg
3.27.1.10	+4 m leg extension (extra over)	to be specified		tonne/leg
3.27.1.11	+5 m leg extension (extra over)	to be specified		tonne/leg
3.27.2	400kV DB Tower			
3.27.2.1	Standard height tower (including 0m leg)	to be specified		tonne
3.27.2.2	+3.0 m body extension	to be specified		tonne
3.27.2.3	+6.0 m body extension	to be specified		tonne
3.27.2.4	+9.0 m body extension	to be specified		tonne
3.27.2.5	+12.0 m body extension	to be specified		tonne
3.27.2.6	+15.0 m body extension	to be specified		tonne
3.27.2.7	+1 m leg extension (extra over)	to be specified		tonne/leg
3.27.2.8	+2 m leg extension (extra over)	to be specified		tonne/leg
3.27.2.9	+3 m leg extension (extra over)	to be specified		tonne/leg
3.27.2.10	+4 m leg extension (extra over)	to be specified		tonne/leg
3.27.2.11	+5 m leg extension (extra over)	to be specified		tonne/leg
3.27.3	400kV DC Tower			
3.27.3.1	Standard height tower (including 0m leg)	to be specified		tonne
3.27.3.2	+3.0 m body extension	to be specified		tonne
3.27.3.3	+6.0 m body extension	to be specified		tonne
3.27.3.4	+9.0 m body extension	to be specified		tonne
3.27.3.5	+12.0 m body extension	to be specified		tonne
3.27.3.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.27.3.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.27.3.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.27.3.9	+4 m leg extension (extra over)	to be specified		tonne/leg
3.27.3.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.27.4	400kV DD Tower			
3.27.4.1	Standard height tower (including 0m leg)	to be specified		tonne
3.27.4.2	+3.0 m body extension	to be specified		tonne
3.27.4.3	+6.0 m body extension	to be specified		tonne
3.27.4.4	+9.0 m body extension	to be specified		tonne
3.27.4.5	+12.0 m body extension	to be specified		tonne
3.27.4.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.27.4.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.27.4.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.27.4.9	+4 m leg extension (extra over)	to be specified		tonne/leg

3.27.4.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.27.5	400kV DE Tower			
3.27.5.1	Standard height tower (including 0m leg)	to be specified		tonne
3.27.5.2	+3.0 m body extension	to be specified		tonne
3.27.5.3	+6.0 m body extension	to be specified		tonne
3.27.5.4	+9.0 m body extension	to be specified		tonne
3.27.5.5	+12.0 m body extension	to be specified		tonne
3.27.5.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.27.5.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.27.5.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.27.5.9	+4 m leg extension (extra over)	to be specified		tonne/leg
3.27.5.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.27.6	400kV DET Tower			
3.27.6.1	Standard height tower (including 0m leg)	to be specified		tonne
3.27.6.2	+3.0 m body extension	to be specified		tonne
3.27.6.3	+6.0 m body extension	to be specified		tonne
3.27.6.4	+9.0 m body extension	to be specified		tonne
3.27.6.5	+1 m leg extension (extra over)	to be specified		tonne/leg
3.27.6.6	+2 m leg extension (extra over)	to be specified		tonne/leg
3.27.6.7	+3 m leg extension (extra over)	to be specified		tonne/leg
3.27.6.8	+4 m leg extension (extra over)	to be specified		tonne/leg
3.27.6.9	+5 m leg extension (extra over)	to be specified		tonne/leg

3.28 Estimated Weight of 132kV Tower

Item	Description	Required	Offered	Unit
3.28.1	132kV DA Tower			
3.28.1.1	Standard height tower (including 0m leg)	to be specified		tonne
3.28.1.2	+3.0 m body extension	to be specified		tonne
3.28.1.3	+6.0 m body extension	to be specified		tonne
3.28.1.4	+9.0 m body extension	to be specified		tonne
3.28.1.5	+12.0 m body extension	to be specified		tonne
3.28.1.6	+15.0 m body extension	to be specified		tonne
3.28.1.7	+1 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.8	+2 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.9	+3 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.10	+4 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.11	+5 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.12	132kV DB Tower			
3.28.1.13	Standard height tower (including 0m leg)	to be specified		tonne
3.28.1.14	+3.0 m body extension	to be specified		tonne
3.28.1.15	+6.0 m body extension	to be specified		tonne
3.28.1.16	+9.0 m body extension	to be specified		tonne
3.28.1.17	+12.0 m body extension	to be specified		tonne
3.28.1.18	+15.0 m body extension	to be specified		tonne
3.28.1.19	+1 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.20	+2 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.21	+3 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.22	+4 m leg extension (extra over)	to be specified		tonne/leg
3.28.1.23	+5 m leg extension (extra over)	to be specified		tonne/leg
3.28.2	132kV DC Tower			
3.28.2.1	Standard height tower (including 0m leg)	to be specified		tonne
3.28.2.2	+3.0 m body extension	to be specified		tonne
3.28.2.3	+6.0 m body extension	to be specified		tonne
3.28.2.4	+9.0 m body extension	to be specified		tonne
3.28.2.5	+12.0 m body extension	to be specified		tonne
3.28.2.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.28.2.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.28.2.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.28.2.9	+4 m leg extension (extra over)	to be specified		tonne/leg
3.28.2.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.28.3	132kV DD Tower			
3.28.3.1	Standard height tower (including 0m leg)	to be specified		tonne
3.28.3.2	+3.0 m body extension	to be specified		tonne
3.28.3.3	+6.0 m body extension	to be specified		tonne
3.28.3.4	+9.0 m body extension	to be specified		tonne
3.28.3.5	+12.0 m body extension	to be specified		tonne

3.28.3.6	+1 m leg extension (extra over)	to be specified		tonne/leg
3.28.3.7	+2 m leg extension (extra over)	to be specified		tonne/leg
3.28.3.8	+3 m leg extension (extra over)	to be specified		tonne/leg
3.28.3.9	+4 m leg extension (extra over)	to be specified		tonne/leg
3.28.3.10	+5 m leg extension (extra over)	to be specified		tonne/leg
3.28.4	132kV DET Tower			
3.28.4.1	Standard height tower (including 0m leg)	to be specified		tonne
3.28.4.2	+3.0 m body extension	to be specified		tonne
3.28.4.3	+6.0 m body extension	to be specified		tonne
3.28.4.4	+9.0 m body extension	to be specified		tonne
3.28.4.5	+1 m leg extension (extra over)	to be specified		tonne/leg
3.28.4.6	+2 m leg extension (extra over)	to be specified		tonne/leg
3.28.4.7	+3 m leg extension (extra over)	to be specified		tonne/leg
3.28.4.8	+4 m leg extension (extra over)	to be specified		tonne/leg
3.28.4.9	+5 m leg extension (extra over)	to be specified		tonne/leg
3.28.5	132kV Spec Tower			
3.28.5.1	Standard height tower (including 0m leg)	to be specified		tonne
3.28.5.2	+3.0 m body extension	to be specified		tonne
3.28.5.3	+6.0 m body extension	to be specified		tonne
3.28.5.4	+9.0 m body extension	to be specified		tonne
3.28.5.5	+1 m leg extension (extra over)	to be specified		tonne/leg
3.28.5.6	+2 m leg extension (extra over)	to be specified		tonne/leg
3.28.5.7	+3 m leg extension (extra over)	to be specified		tonne/leg
3.28.5.8	+4 m leg extension (extra over)	to be specified		tonne/leg
3.28.5.9	+5 m leg extension (extra over)	to be specified		tonne/leg

3.29

12m Wooden Poles

Item	Description	Required	Offered	Unit
3.29.1	Type	Flat top cut eucalyptus pole		
3.29.2	Pole length	12		m
3.29.3	Top diameter	160 – 180		mm
3.29.4	Poles shall be strength tested for a fibre stress of 55Mpa	Required		
3.29.5	Force required to cause a fibre stress of 55MPa			
3.29.5.1	Cantilever loading	5.23		KN
3.29.5.2	Midpoint loading	13		KN
3.29.6	Average moisture content of poles at the time of treatment shall not exceed 250 g/kg but no individual pole, shall have a moisture content that exceeds 280 g/kg	Required		
3.29.7	Preservative	Creosote		
3.29.8	Minimum retention of creosote per batch	115		kg/m ³
3.29.9	Nail plate	Zinc coated steel		
3.29.10	Hazard class	H4		
3.29.11	Nail plate thickness	1.2		mm
3.29.12	Minimum nail plate coverage of the applicable pole ends (tip and butt ends)	50		%
3.29.13	Minimum punched nail length	14		mm
3.29.14	Pole name plate marking as per clause 4.2 of this specification	Required		
3.29.15	Name plate position	3,5 ± 0.050 from the butt		m
3.29.16	Environmental Conditions			
3.29.16.1	Ambient Temperature range	-1 to 45		°C
3.29.16.2	Relative Humidity	85		%
3.29.16.3	Altitude above sea level	1600		m
3.29.17	Other Requirements			
3.29.17.1	Previous type test results/certification from a recognized third party testing facility to be provided with bid for at least one of the following: 9m, 10m and/or 12m pole(s).	Required		
3.29.17.2	Quality assurance certification to be provided with bid	Required		
3.29.17.3	Detailed drawings showing dimensions, hole positions and tolerances to be provided with bid	Required		
3.29.17.4	Strength test results on samples to be provided on delivery	Required		
3.29.17.5	Applicable standard (s)	SANS 754		

4.

Foundations

4.1.

Foundations: Material

Item	Description	Required	Offered	Unit
4.1.1	Standard applied for portland cement	EN 197-1		
4.1.2	Standard applied fo sulphate resisting cement	EN 197-1		
4.1.3	Standard applied for aggregate	EN 12620		
4.1.4	Standard applied for reinforcement steel	EN 10080		
4.1.5	Concrete class (nominal cube strength ≥ 37 N/mm ²) according to	C30/C37 EN 206-1		
4.1.6	Reinforcing grade (ribbed bars fy ≥ 420 (500) N/mm ²) according to	$\geq$ BSt 420 (K500CT) EN 10080		
4.1.7	Cement grade (standard Portland cement) according to	CE 42.5 EN 197		
4.1.8	Outline drawing of each type of foundation	Yes		
4.1.9	Soil investigation:			
4.1.10	Penetration equipment in accordance with the characteristic data as specified in the Technical Requirements, Soil Investigations: If other types, specify characteristic data.	SPT or DPL or CPT or other (Bidder to specify method)		
4.1.11	Admixtures	BS EN 480 or ASTM C494, BS EN 934 or ASTM C260		

4.2

Estimated Tower Foundation Details

4.2.1

400kV Foundations

Item	Particulars	Unit	Minimum Requirements	Offered
4.2.1.1	400kV DA - Estimated Tower Foundation Details			
4.2.1.1.1	Class 1 Rock concrete volume	m ³		
4.2.1.1.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.1.1.3	Class 2 concrete volume	m ³		
4.2.1.1.4	Class 2 excavation a x b x h	m x m x m		
4.2.1.1.5	Class 3 concrete volume	m ³		
4.2.1.1.6	Class 3 excavation a x b x h	m x m x m		
4.2.1.1.7	Class 4 concrete volume	m ³		
4.2.1.1.8	Class 4 excavation a x b x h	m x m x m		
4.2.1.1.9	Class 4W concrete volume	m3		
4.2.1.1.10	Class 4W excavation a x b x h	m x m x m		
4.2.1.1.11	Class 5 concrete volume	m3		
4.2.1.1.12	Class 5 excavation a x b x h	m x m x m		
4.2.1.1.13	Class 5W concrete volume	m3		
4.2.1.1.14	Class 5W excavation a x b x h	m x m x m		
4.2.1.1.15	Class 6 concrete volume	m3		
4.2.1.1.16	Class 6 excavation a x b x h	m x m x m		
4.2.1.2	400kV DB - Estimated Tower Foundation Details			
4.2.1.2.1	Class 1 Rock concrete volume	m ³		
4.2.1.2.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.1.2.3	Class 2 concrete volume	m ³		
4.2.1.2.4	Class 2 excavation a x b x h	m x m x m		
4.2.1.2.5	Class 3 concrete volume	m ³		
4.2.1.2.6	Class 3 excavation a x b x h	m x m x m		
4.2.1.2.7	Class 4 concrete volume	m ³		
4.2.1.2.8	Class 4 excavation a x b x h	m x m x m		
4.2.1.2.9	Class 4W concrete volume	m ³		
4.2.1.2.10	Class 4W excavation a x b x h	m x m x m		
4.2.1.2.11	Class 5 concrete volume	m ³		
4.2.1.2.12	Class 5 excavation a x b x h	m x m x m		
4.2.1.2.13	Class 5W concrete volume	m ³		
4.2.1.2.14	Class 5W excavation a x b x h	m x m x m		
4.2.1.2.15	Class 6 concrete volume	m3		
4.2.1.2.16	Class 6 excavation a x b x h	m x m x m		
4.2.1.3	400kV DC - Estimated Tower Foundation Details			
4.2.1.3.1	Class 1 Rock concrete volume	m ³		
4.2.1.3.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.1.3.3	Class 2 concrete volume	m ³		
4.2.1.3.4	Class 2 excavation a x b x h	m x m x m		
4.2.1.3.5	Class 3 concrete volume	m ³		
4.2.1.3.6	Class 3 excavation a x b x h	m x m x m		

4.2.1.3.7	Class 4 concrete volume	m ³		
4.2.1.3.8	Class 4 excavation a x b x h	m x m x m		
4.2.1.3.9	Class 4W concrete volume	m ³		
4.2.1.3.10	Class 4W excavation a x b x h	m x m x m		
4.2.1.3.11	Class 5 concrete volume	m ³		
4.2.1.3.12	Class 5 excavation a x b x h	m x m x m		
4.2.1.3.13	Class 5W concrete volume	m ³		
4.2.1.3.14	Class 5W excavation a x b x h	m x m x m		
4.2.1.3.15	Class 6 concrete volume	m3		
4.2.1.3.16	Class 6 excavation a x b x h	m x m x m		
4.2.1.4	400kV DD - Estimated Tower Foundation Details			
4.2.1.4.1	Class 1 Rock concrete volume	m ³		
4.2.1.4.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.1.4.3	Class 2 concrete volume	m ³		
4.2.1.4.4	Class 2 excavation a x b x h	m x m x m		
4.2.1.4.5	Class 3 concrete volume	m ³		
4.2.1.4.6	Class 3 excavation a x b x h	m x m x m		
4.2.1.4.7	Class 4 concrete volume	m ³		
4.2.1.4.8	Class 4 excavation a x b x h	m x m x m		
4.2.1.4.9	Class 4W concrete volume	m ³		
4.2.1.4.10	Class 4W excavation a x b x h	m x m x m		
4.2.1.4.11	Class 5 concrete volume	m ³		
4.2.1.4.12	Class 5 excavation a x b x h	m x m x m		
4.2.1.4.13	Class 5W concrete volume	m ³		
4.2.1.4.14	Class 5W excavation a x b x h	m x m x m		
4.2.1.4.15	Class 6 concrete volume	m3		
4.2.1.4.16	Class 6 excavation a x b x h	m x m x m		
4.2.1.5	400kV DE - Estimated Tower Foundation Details			
4.2.1.5.1	Class 1 Rock concrete volume	m ³		
4.2.1.5.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.1.5.3	Class 2 concrete volume	m ³		
4.2.1.5.4	Class 2 excavation a x b x h	m x m x m		
4.2.1.5.5	Class 3 concrete volume	m ³		
4.2.1.5.6	Class 3 excavation a x b x h	m x m x m		
4.2.1.5.7	Class 4 concrete volume	m ³		
4.2.1.5.8	Class 4 excavation a x b x h	m x m x m		
4.2.1.5.9	Class 4W concrete volume	m ³		
4.2.1.5.10	Class 4W excavation a x b x h	m x m x m		
4.2.1.5.11	Class 5 concrete volume	m ³		
4.2.1.5.12	Class 5 excavation a x b x h	m x m x m		
4.2.1.5.13	Class 5W concrete volume	m ³		
4.2.1.5.14	Class 5W excavation a x b x h	m x m x m		
4.2.1.5.15	Class 6 concrete volume	m3		
4.2.1.5.16	Class 6 excavation a x b x h	m x m x m		
4.2.1.6	400kV DET - Tower Foundation Details			
4.2.1.6.1	Class 1 Rock concrete volume	m ³		
4.2.1.6.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.1.6.3	Class 2 concrete volume	m ³		
4.2.1.6.4	Class 2 excavation a x b x h	m x m x m		
4.2.1.6.5	Class 3 concrete volume	m ³		
4.2.1.6.6	Class 3 excavation a x b x h	m x m x m		
4.2.1.6.7	Class 4 concrete volume	m ³		
4.2.1.6.8	Class 4 excavation a x b x h	m x m x m		
4.2.1.6.9	Class 4W concrete volume	m ³		
4.2.1.6.10	Class 4W excavation a x b x h	m x m x m		
4.2.1.6.11	Class 5 concrete volume	m ³		
4.2.1.6.12	Class 5 excavation a x b x h	m x m x m		
4.2.1.6.13	Class 5W concrete volume	m ³		
4.2.1.6.14	Class 5W excavation a x b x h	m x m x m		
4.2.1.6.15	Class 6 concrete volume	m3		
4.2.1.6.16	Class 6 excavation a x b x h	m x m x m		

4.2.2 330kV Foundations

Item	Particulars	Unit	Minimum Requirements	Offered
4.2.2.1	330kV DA - Estimated Tower Foundation Details			
4.2.2.1.1	Class 1 Rock concrete volume	m ³		
4.2.2.1.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		

4.2.2.1.3	Class 2 concrete volume	m ³		
4.2.2.1.4	Class 2 excavation a x b x h	m x m x m		
4.2.2.1.5	Class 3 concrete volume	m ³		
4.2.2.1.6	Class 3 excavation a x b x h	m x m x m		
4.2.2.1.7	Class 4 concrete volume	m ³		
4.2.2.1.8	Class 4 excavation a x b x h	m x m x m		
4.2.2.1.9	Class 4W concrete volume	m ³		
4.2.2.1.10	Class 4W excavation a x b x h	m x m x m		
4.2.2.1.11	Class 5 concrete volume	m ³		
4.2.2.1.12	Class 5 excavation a x b x h	m x m x m		
4.2.2.1.13	Class 5W concrete volume	m ³		
4.2.2.1.14	Class 5W excavation a x b x h	m x m x m		
4.2.2.1.15	Class 6 concrete volume	m ³		
4.2.2.1.16	Class 6 excavation a x b x h	m x m x m		
4.2.2.2	330kV DB - Estimated Tower Foundation Details			
4.2.2.2.1	Class 1 Rock concrete volume	m ³		
4.2.2.2.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.2.2.3	Class 2 concrete volume	m ³		
4.2.2.2.4	Class 2 excavation a x b x h	m x m x m		
4.2.2.2.5	Class 3 concrete volume	m ³		
4.2.2.2.6	Class 3 excavation a x b x h	m x m x m		
4.2.2.2.7	Class 4 concrete volume	m ³		
4.2.2.2.8	Class 4 excavation a x b x h	m x m x m		
4.2.2.2.9	Class 4W concrete volume	m ³		
4.2.2.2.10	Class 4W excavation a x b x h	m x m x m		
4.2.2.2.11	Class 5 concrete volume	m ³		
4.2.2.2.12	Class 5 excavation a x b x h	m x m x m		
4.2.2.2.13	Class 5W concrete volume	m ³		
4.2.2.2.14	Class 5W excavation a x b x h	m x m x m		
4.2.2.2.15	Class 6 concrete volume	m ³		
4.2.2.2.16	Class 6 excavation a x b x h	m x m x m		
4.2.2.3	330kV DC - Estimated Tower Foundation Details			
4.2.2.3.1	Class 1 Rock concrete volume	m ³		
4.2.2.3.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.2.3.3	Class 2 concrete volume	m ³		
4.2.2.3.4	Class 2 excavation a x b x h	m x m x m		
4.2.2.3.5	Class 3 concrete volume	m ³		
4.2.2.3.6	Class 3 excavation a x b x h	m x m x m		
4.2.2.3.7	Class 4 concrete volume	m ³		
4.2.2.3.8	Class 4 excavation a x b x h	m x m x m		
4.2.2.3.9	Class 4W concrete volume	m ³		
4.2.2.3.10	Class 4W excavation a x b x h	m x m x m		
4.2.2.3.11	Class 5 concrete volume	m ³		
4.2.2.3.12	Class 5 excavation a x b x h	m x m x m		
4.2.2.3.13	Class 5W concrete volume	m ³		
4.2.2.3.14	Class 5W excavation a x b x h	m x m x m		
4.2.2.3.15	Class 6 concrete volume	m ³		
4.2.2.3.16	Class 6 excavation a x b x h	m x m x m		
4.2.2.4	330kV DD - Estimated Tower Foundation Details			
4.2.2.4.1	Class 1 Rock concrete volume	m ³		
4.2.2.4.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.2.4.3	Class 2 concrete volume	m ³		
4.2.2.4.4	Class 2 excavation a x b x h	m x m x m		
4.2.2.4.5	Class 3 concrete volume	m ³		
4.2.2.4.6	Class 3 excavation a x b x h	m x m x m		
4.2.2.4.7	Class 4 concrete volume	m ³		
4.2.2.4.8	Class 4 excavation a x b x h	m x m x m		
4.2.2.4.9	Class 4W concrete volume	m ³		
4.2.2.4.10	Class 4W excavation a x b x h	m x m x m		
4.2.2.4.11	Class 5 concrete volume	m ³		
4.2.2.4.12	Class 5 excavation a x b x h	m x m x m		
4.2.2.4.13	Class 5W concrete volume	m ³		
4.2.2.4.14	Class 5W excavation a x b x h	m x m x m		
4.2.2.4.15	Class 6 concrete volume	m ³		
4.2.2.4.16	Class 6 excavation a x b x h	m x m x m		
4.2.2.5	330kV DE - Estimated Tower Foundation Details			
4.2.2.5.1	Class 1 Rock concrete volume	m ³		

4.2.2.5.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.2.5.3	Class 2 concrete volume	m ³		
4.2.2.5.4	Class 2 excavation a x b x h	m x m x m		
4.2.2.5.5	Class 3 concrete volume	m ³		
4.2.2.5.6	Class 3 excavation a x b x h	m x m x m		
4.2.2.5.7	Class 4 concrete volume	m ³		
4.2.2.5.8	Class 4 excavation a x b x h	m x m x m		
4.2.2.5.9	Class 4W concrete volume	m ³		
4.2.2.5.10	Class 4W excavation a x b x h	m x m x m		
4.2.2.5.11	Class 5 concrete volume	m ³		
4.2.2.5.12	Class 5 excavation a x b x h	m x m x m		
4.2.2.5.13	Class 5W concrete volume	m ³		
4.2.2.5.14	Class 5W excavation a x b x h	m x m x m		
4.2.2.5.15	Class 6 concrete volume	m3		
4.2.2.5.16	Class 6 excavation a x b x h	m x m x m		
4.2.2.6	330kV DET - Tower Foundation Details			
4.2.2.6.1	Class 1 Rock concrete volume	m ³		
4.2.2.6.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.2.6.3	Class 2 concrete volume	m ³		
4.2.2.6.4	Class 2 excavation a x b x h	m x m x m		
4.2.2.6.5	Class 3 concrete volume	m ³		
4.2.2.6.6	Class 3 excavation a x b x h	m x m x m		
4.2.2.6.7	Class 4 concrete volume	m ³		
4.2.2.6.8	Class 4 excavation a x b x h	m x m x m		
4.2.2.6.9	Class 4W concrete volume	m ³		
4.2.2.6.10	Class 4W excavation a x b x h	m x m x m		
4.2.2.6.11	Class 5 concrete volume	m ³		
4.2.2.6.12	Class 5 excavation a x b x h	m x m x m		
4.2.2.6.13	Class 5W concrete volume	m ³		
4.2.2.6.14	Class 5W excavation a x b x h	m x m x m		
4.2.2.6.15	Class 6 concrete volume	m3		
4.2.2.6.16	Class 6 excavation a x b x h	m x m x m		

4.2.3 132kV Foundations

Item	Particulars	Unit	Minimum Requirements	Offered
4.2.3.1	132kV DA - Estimated Tower Foundation Details			
4.2.3.1.1	Class 1 Rock concrete volume	m ³		
4.2.3.1.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.3.1.3	Class 2 concrete volume	m ³		
4.2.3.1.4	Class 2 excavation a x b x h	m x m x m		
4.2.3.1.5	Class 3 concrete volume	m ³		
4.2.3.1.6	Class 3 excavation a x b x h	m x m x m		
4.2.3.1.7	Class 4 concrete volume	m ³		
4.2.3.1.8	Class 4 excavation a x b x h	m x m x m		
4.2.3.1.9	Class 4W concrete volume	m3		
4.2.3.1.10	Class 4W excavation a x b x h	m x m x m		
4.2.3.1.11	Class 5 concrete volume	m3		
4.2.3.1.12	Class 5 excavation a x b x h	m x m x m		
4.2.3.1.13	Class 5W concrete volume	m3		
4.2.3.1.14	Class 5W excavation a x b x h	m x m x m		
4.2.3.1.15	Class 6 concrete volume	m3		
4.2.3.1.16	Class 6 excavation a x b x h	m x m x m		
4.2.3.2	132kV DB - Estimated Tower Foundation Details			
4.2.3.2.1	Class 1 Rock concrete volume	m ³		
4.2.3.2.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.3.2.3	Class 2 concrete volume	m ³		
4.2.3.2.4	Class 2 excavation a x b x h	m x m x m		
4.2.3.2.5	Class 3 concrete volume	m ³		
4.2.3.2.6	Class 3 excavation a x b x h	m x m x m		
4.2.3.2.7	Class 4 concrete volume	m ³		
4.2.3.2.8	Class 4 excavation a x b x h	m x m x m		
4.2.3.2.9	Class 4W concrete volume	m ³		
4.2.3.2.10	Class 4W excavation a x b x h	m x m x m		
4.2.3.2.11	Class 5 concrete volume	m ³		
4.2.3.2.12	Class 5 excavation a x b x h	m x m x m		
4.2.3.2.13	Class 5W concrete volume	m ³		
4.2.3.2.14	Class 5W excavation a x b x h	m x m x m		

4.2.3.2.15	Class 6 concrete volume	m ³		
4.2.3.2.16	Class 6 excavation a x b x h	m x m x m		
4.2.3.3	132kV DC - Estimated Tower Foundation Details			
4.2.3.3.1	Class 1 Rock concrete volume	m ³		
4.2.3.3.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.3.3.3	Class 2 concrete volume	m ³		
4.2.3.3.4	Class 2 excavation a x b x h	m x m x m		
4.2.3.3.5	Class 3 concrete volume	m ³		
4.2.3.3.6	Class 3 excavation a x b x h	m x m x m		
4.2.3.3.7	Class 4 concrete volume	m ³		
4.2.3.3.8	Class 4 excavation a x b x h	m x m x m		
4.2.3.3.9	Class 4W concrete volume	m ³		
4.2.3.3.10	Class 4W excavation a x b x h	m x m x m		
4.2.3.3.11	Class 5 concrete volume	m ³		
4.2.3.3.12	Class 5 excavation a x b x h	m x m x m		
4.2.3.3.13	Class 5W concrete volume	m ³		
4.2.3.3.14	Class 5W excavation a x b x h	m x m x m		
4.2.3.3.15	Class 6 concrete volume	m ³		
4.2.3.3.16	Class 6 excavation a x b x h	m x m x m		
4.2.3.4	132kV DD - Estimated Tower Foundation Details			
4.2.3.4.1	Class 1 Rock concrete volume	m ³		
4.2.3.4.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.3.4.3	Class 2 concrete volume	m ³		
4.2.3.4.4	Class 2 excavation a x b x h	m x m x m		
4.2.3.4.5	Class 3 concrete volume	m ³		
4.2.3.4.6	Class 3 excavation a x b x h	m x m x m		
4.2.3.4.7	Class 4 concrete volume	m ³		
4.2.3.4.8	Class 4 excavation a x b x h	m x m x m		
4.2.3.4.9	Class 4W concrete volume	m ³		
4.2.3.4.10	Class 4W excavation a x b x h	m x m x m		
4.2.3.4.11	Class 5 concrete volume	m ³		
4.2.3.4.12	Class 5 excavation a x b x h	m x m x m		
4.2.3.4.13	Class 5W concrete volume	m ³		
4.2.3.4.14	Class 5W excavation a x b x h	m x m x m		
4.2.3.4.15	Class 6 concrete volume	m ³		
4.2.3.4.16	Class 6 excavation a x b x h	m x m x m		
4.2.3.5	132kV DET - Estimated Tower Foundation Details			
4.2.3.5.1	Class 1 Rock concrete volume	m ³		
4.2.3.5.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.3.5.3	Class 2 concrete volume	m ³		
4.2.3.5.4	Class 2 excavation a x b x h	m x m x m		
4.2.3.5.5	Class 3 concrete volume	m ³		
4.2.3.5.6	Class 3 excavation a x b x h	m x m x m		
4.2.3.5.7	Class 4 concrete volume	m ³		
4.2.3.5.8	Class 4 excavation a x b x h	m x m x m		
4.2.3.5.9	Class 4W concrete volume	m ³		
4.2.3.5.10	Class 4W excavation a x b x h	m x m x m		
4.2.3.5.11	Class 5 concrete volume	m ³		
4.2.3.5.12	Class 5 excavation a x b x h	m x m x m		
4.2.3.5.13	Class 5W concrete volume	m ³		
4.2.3.5.14	Class 5W excavation a x b x h	m x m x m		
4.2.3.5.15	Class 6 concrete volume	m ³		
4.2.3.5.16	Class 6 excavation a x b x h	m x m x m		
4.2.3.6	132kV SPEC - Tower Foundation Details			
4.2.3.6.1	Class 1 Rock concrete volume	m ³		
4.2.3.6.2	Class 1 Rock excavation: width X breadth X depth	m x m x m		
4.2.3.6.3	Class 2 concrete volume	m ³		
4.2.3.6.4	Class 2 excavation a x b x h	m x m x m		
4.2.3.6.5	Class 3 concrete volume	m ³		
4.2.3.6.6	Class 3 excavation a x b x h	m x m x m		
4.2.3.6.7	Class 4 concrete volume	m ³		
4.2.3.6.8	Class 4 excavation a x b x h	m x m x m		
4.2.3.6.9	Class 4W concrete volume	m ³		
4.2.3.6.10	Class 4W excavation a x b x h	m x m x m		
4.2.3.6.11	Class 5 concrete volume	m ³		
4.2.3.6.12	Class 5 excavation a x b x h	m x m x m		
4.2.3.6.13	Class 5W concrete volume	m ³		

4.2.3.6.14	Class 5W excavation a x b x h	m x m x m		
4.2.3.6.15	Class 6 concrete volume	m3		
4.2.3.6.16	Class 6 excavation a x b x h	m x m x m		

5.

5.1.

Transmission Lines

Insulators and fittings

Insulators: Glass Insulator 120kN

Item	Description	Required	Offered	Unit
5.1.1	Manufacturer	to be specified		
5.1.2	Country of origin	to be specified		
5.1.3	Standard	IEC 60305		
5.1.4	Nominal Characteristics			
5.1.5	Nominal Line Voltage	400		kV
5.1.6	Coupling	Ball and Socket		
5.1.7	Type	Fog profile glass insulator		
5.1.8	Nominal disc diameter	280		mm
5.1.9	Unit spacing	146		mm
5.1.10	Minimal nominal creepage distance	450		mm
5.1.11	Dimension fittings	16A		IEC
5.1.12	Related electro-mechanical strength	120		kN
5.1.13	Mechanical Routine Test Load	60		kN
5.1.14	Power frequency dry withstand	IEC60383		
5.1.15	Power frequency wet withstand	IEC60383		
5.1.16	Dry impulse withstand voltage	140		kV
5.1.17	Min. puncture voltage	130		kV
5.1.18	Material of			
5.1.19	- Socket	to be specified		
5.1.20	- Pin ball	to be specified		
5.1.21	- Locking device	to be specified		
5.1.22	Type of locking device	to be specified		
5.1.23	Mass of zinc coating on cap/pin	to be specified		g/m²
5.1.24	Sacrificial zinc sleeve on pin	Yes		
5.1.25	Mass per unit	to be specified		kg
5.1.26	Type test certificate attached	Yes		

5.2.

Insulators: Glass Insulator 160kN

Item	Description	Required	Offered	Unit
5.2.1	Manufacturer	to be specified		
5.2.2	Country of origin	to be specified		
5.2.3	Standard	IEC 60305		
5.2.4	Nominal Characteristics			
5.2.5	Nominal Line Voltage	330		kV
5.2.6	Coupling	Ball and Socket		
5.2.7	Type	Fog profile glass insulator		
5.2.8	Nominal disc diameter	330		mm
5.2.9	Unit spacing	146		mm
5.2.10	Minimal nominal creepage distance	450		mm
5.2.11	Dimension fittings	20		IEC
5.2.12	Related electro-mechanical strength	160		kN
5.2.13	Mechanical Routine Test Load	80		kN
5.2.14	Power frequency dry withstand	IEC60383		
5.2.15	Power frequency wet withstand	IEC60383		
5.2.16	Dry impulse withstand voltage	145		kV
5.2.17	Min. puncture voltage	130		kV
5.2.18	Material of			
5.2.19	- Socket	to be specified		
5.2.20	- Pin ball	to be specified		
5.2.21	- Locking device	to be specified		
5.2.22	Type of locking device	to be specified		
5.2.23	Mass of zinc coating on cap/pin	to be specified		g/m²
5.2.24	Sacrificial zinc sleeve on pin	YES		
5.2.25	Mass per unit	to be specified		kg
5.2.26	Type test certificate attached	Yes		

5.3.

Insulators: Glass Insulator 210kN

Item	Description	Required	Offered	Unit
5.3.1	Manufacturer	to be specified		

5.3.2	Country of origin	to be specified		
5.3.3	Standard	IEC 60305		
5.3.4	Nominal Characteristics			
5.3.5	Nominal Line Voltage	400		kV
5.3.6	Coupling	Ball and Socket		
5.3.7	Type	Fog profile glass insulator		
5.3.8	Nominal disc diameter	330		mm
5.3.9	Unit spacing	170		mm
5.3.10	Minimal nominal creepage distance	525		mm
5.3.11	Dimension fittings	20		IEC
5.3.12	Related electro-mechanical strength	210		kN
5.3.13	Mechanical Routine Test Load	105		kN
5.3.14	Power frequency dry withstand	IEC60383		
5.3.15	Power frequency wet withstand	IEC60383		
5.3.16	Dry impulse withstand voltage	145		kV
5.3.17	Min. puncture voltage	130		kV
5.3.18	Material of			
5.3.19	- Socket	to be specified		
5.3.20	- Pin ball	to be specified		
5.3.21	- Locking device	to be specified		
5.3.22	Type of locking device	to be specified		
5.3.23	Mass of zinc coating on cap/pin	to be specified		g/m²
5.3.24	Sacrificial zinc sleeve on pin	YES		
5.3.25	Mass per unit	to be specified		kg
5.3.26	Type test certificate attached	to be specified		

5.4. Single/Jumper Suspension String Assembly for 400kV Line

Item	Description	Required	Offered	Unit
5.4.1	Manufacturer	to be specified		
5.4.2	Country of origin	to be specified		
5.4.3	Nominal Characteristics			
5.4.4	Overall Length of String (without weight)	4700		mm
5.4.5	No. of units per string	29		
5.4.6	Total creepage	13050		mm
5.4.7	Arcing distance	3900		mm
5.4.8	Lightning impulse withstand Voltage pos/neg	1675		kV
5.4.9	Switching Impulse withstand (wet) Voltage	1155		kV
5.4.10	Wet power frequency withstand Voltage	670		kV
5.4.11	Corona Inception Voltage	>270		kV
5.4.12	Radio interference Voltage	220		kV
5.4.13	Radio interference	45		dB/1µV
5.4.14	Electro-mechanical failing load	120		kN
5.4.15	Creepage distance (IEC60815) USCD	53,7		mm/kV

5.5. Single/Jumper Suspension String Assembly for 330kV Line

Item	Description	Required	Offered	Unit
5.5.1	Manufacturer	to be specified		
5.5.2	Country of origin	to be specified		
5.5.3	Nominal Characteristics			
5.5.4	Overall Length of String (without weight)	3700		mm
5.5.5	No. of units per string	22		
5.5.6	Total creepage	9900		mm
5.5.7	Arcing distance	2900		mm
5.5.8	Lightning impulse withstand Voltage pos/neg	1300		kV
5.5.9	Switching Impulse withstand (wet) Voltage	1010		kV
5.5.10	Wet power frequency withstand Voltage	580		kV
5.5.11	Corona Inception Voltage	>230		kV
5.5.12	Radio interference Voltage	220		kV
5.5.13	Radio interference	45		dB/1µV
5.5.14	Electro-mechanical failing load	120		kN
5.5.15	Creepage distance (IEC60815) USCD	43,3		mm/kV

5.6. Double Suspension String Assembly for 400kV Line

Item	Description	Required	Offered	Unit
5.6.1	Manufacturer	to be specified		

5.6.2	Country of origin	to be specified		
5.6.3	Nominal Characteristics			
5.6.4	Overall Length of String (without weight)	5000		mm
5.6.5	No. of units per string	2 x 29		
5.6.6	Total creepage	13050		mm
5.6.7	Arcing distance	3900		mm
5.6.8	Lightning impulse withstand Voltage pos/neg	1675		kV
5.6.9	Switching Impulse withstand (wet) Voltage	1155		kV
5.6.10	Wet power frequency withstand Voltage	670		kV
5.6.11	Corona Inception Voltage	>270		kV
5.6.12	Radio interference Voltage	220kV		kV
5.6.13	Radio interference	45		dB/1µV
5.6.14	Electro-mechanical failing load	2x120		kN
5.6.15	String orientation	longitudinal		
5.6.15	Creepage distance (IEC60815) USCD	53,7		mm/kV

5.7. Double Suspension String Assembly for 330kV Line

Item	Description	Required	Offered	Unit
5.7.1	Manufacturer	to be specified		
5.7.2	Country of origin	to be specified		
5.7.3	Nominal Characteristics			
5.7.4	Overall Length of String (without weight)	3950		mm
5.7.5	No. of units per string	2 x 22		
5.7.6	Total creepage	9900		mm
5.7.7	Arcing distance	2900		mm
5.7.8	Lightning impulse withstand Voltage pos/neg	1300		kV
5.7.9	Switching Impulse withstand (wet) Voltage	1010		kV
5.7.10	Wet power frequency withstand Voltage	580		kV
5.7.11	Corona Inception Voltage	>230		kV
5.7.12	Radio interference Voltage	220		kV
5.7.13	Radio interference	45		dB/1µV
5.7.14	Electro-mechanical failing load	2x120		
5.7.15	String orientation	longitudinal		kN
5.7.15	Creepage distance (IEC60815) USCD	43,3		mm/kV

5.8. Double Tension String Assembly for 400kV Line

Item	Description	Required	Offered	Unit
5.8.1	Manufacturer	to be specified		
5.8.2	Country of origin	to be specified		
5.8.3	Nominal Characteristics			
5.8.4	Overall Length of String	5500		mm
5.8.5	No. of units per string	2 x 29		
5.8.6	Total creepage	15225		mm
5.8.7	Arcing distance	3900		mm
5.8.8	Lightning impulse withstand Voltage pos/neg	1675		kV
5.8.9	Switching Impulse withstand (wet) Voltage	1155		kV
5.8.10	Wet power frequency withstand Voltage	670		kV
5.8.11	Corona Inception Voltage	>270		kV
5.8.12	Radio interference Voltage	220		kV
5.8.13	Radio interference	45		dB/1µV
5.8.14	Electro-mechanical failing load	2*210		kN
5.8.15	Creepage distance (IEC60815) USCD	53,7		mm/kV

5.9. Double Tension String Assembly for 330kV Line

Item	Description	Required	Offered	Unit
5.9.1	Manufacturer	to be specified		
5.9.2	Country of origin	to be specified		
5.9.3	Nominal Characteristics			
5.9.4	Overall Length of String	4000		mm
5.9.5	No. of units per string	2 x 22		
5.9.6	Total creepage	9900		mm
5.9.7	Arcing distance	2900		mm
5.9.8	Lightning impulse withstand Voltage pos/neg	1300		kV
5.9.9	Switching Impulse withstand (wet) Voltage	1010		kV
5.9.10	Wet power frequency withstand Voltage	580		kV

5.9.11	Corona Inception Voltage	>230		kV
5.9.12	Radio interference Voltage	220		kV
5.9.13	Radio interference	45		dB/1μV
5.9.14	Electro-mechanical failing load	2*160		kN
59.15	Creepage distance (IEC60815) USCD	43,3		mm/kV

5.10.132kV Composite Insulator String

Item	Description	Required	Offered	Unit
5.10.1	Manufacturer	Bidder to specify		
5.10.2	Country of origin	Bidder to specify		
5.10.3	Nominal Characteristics			
5.10.4	Standard	IEC 61109, IEC 60120		
5.10.5	No. of units per string	1		
5.10.6	Total creepage	3625		mm
5.10.7	Arcing distance	1200		mm
5.10.8	Lightning Impulse withstand Voltage pos/neg	650		kV
5.10.9	[Deleted]			
5.10.10	Wet power frequency withstand Voltage	275		kV
5.10.11	Corona Inception Voltage	>230		kV
5.10.12	Radio interference Voltage	220		kV
5.10.13	Radio interference	45		dB/1μV
5.10.14	Electro-mechanical failing load	120		kN
5.10.15	Specific creepage distance for site pollution level	25		mm/kV
5.10.16	Creepage distance (IEC60815) USCD	43,3		mm/kV

5.11. Composite Suspension Insulator 132kV

Item	Description	Required	Offered	Unit
5.11.1	Manufacturer	to be specified		
5.11.2	Country of origin	to be specified		
5.11.3	Standard	IEC 61109 / IEC 60120		
5.11.4	Nominal Characteristics			
5.11.5	Nominal Line Voltage	132		kV
5.11.6	Highest system Voltage	145		kV
5.11.7	Coupling	Ball and Socket		
5.11.8	Type	Silicon composite insulator		
5.11.9	a) Material from which insulator sheds are manufactured	High temperature vulcanised silicon rubber		
5.11.10	b) Material from which insulator rods are manufactured	Epoxy resin and ECR (Glass fibre reinforced)		
5.11.11	Minimal nominal creepage distance	3625		mm
5.11.12	Dimension fittings	16		IEC
5.11.13	Related electro-mechanical strength	120		kN
5.11.14	Mechanical Routine Test Load	80		kN
5.11.15	Power frequency dry withstand	IEC 60383		
5.11.16	Power frequency wet withstand	IEC 60383		
5.11.17	Dry impulse withstand voltage			kV
5.11.18	Min. puncture voltage			kV
5.11.19	Material of			
5.11.20	a) Socket	Forged steel hot dip galvanised		
5.11.21	b) Pin ball			
5.11.22	c) Locking device			
5.11.23	Type of locking device			
5.11.24	Mass of zinc coating on cap/pin	>85		g/m²
5.11.25	Sacrificial zinc sleeve on pin	Yes		
5.11.26	Mass per unit			kg
5.11.27	Type test certificate attached			

5.12. Composite Tension Insulator 132kV

Item	Description	Required	Offered	Unit
5.12.1	Manufacturer	to be specified		
5.12.2	Country of origin	to be specified		
5.12.3	Standard	IEC 61109 / IEC 60120		
5.12.4	Nominal Characteristics			
5.12.5	Nominal Line Voltage	132		kV
5.12.6	Highest system Voltage	145		kV

5.12.7	Coupling	Ball and Socket		
5.12.8	Type	Silicon composite insulator		
5.12.9	a) Material from which insulator sheds are manufactured	High temperature vulcanised silicon rubber		
5.12.10	b) Material from which insulator rods are manufactured	Epoxy resin and ECR (Glass fibre reinforced)		
5.12.11	Minimal nominal creepage distance	3625		mm
5.12.12	Dimension fittings	16		IEC
5.12.13	Related electro-mechanical strength	120		kN
5.12.14	Mechanical Routine Test Load	80		kN
5.12.15	Power frequency dry withstand	IEC 60383		
5.12.16	Power frequency wet withstand	IEC 60383		
5.12.17	Dry impulse withstand voltage			kV
5.12.18	Min. puncture voltage			kV
5.12.19	Material of			
5.12.20	a) Socket	Forged steel hot dip galvanised		
5.12.21	b) Pin ball			
5.12.22	c) Locking device			
5.12.23	Type of locking device			
5.12.24	Mass of zinc coating on cap/pin	>85		g/m²
5.12.25	Sacrificial zinc sleeve on pin	Yes		
5.12.26	Mass per unit			kg
5.12.27	Type test certificate attached			

5.13. Fittings: Hardware and fittings for Optical Ground Wire

Item	Description	Required	Offered	Unit
5.13.1	SUSPENSION CLAMPS			
5.13.2	Manufacturer	to be specified		
5.13.3	Manufacturer's type and reference	to be specified		
5.13.4	Country of origin	to be specified		
5.13.5	Description			
5.13.6	Standard specification applied	EN 50341		
5.13.7	Type of suspension clamps	to be specified		
5.13.8	Breaking strength of suspension clamps	to be specified		kN
5.13.9	Slipping of suspension clamps	to be specified		kN
5.13.10	HELIACAL DEAD ENDS			
5.13.11	Manufacturer	to be specified		
5.13.12	Manufacturer's type and reference	to be specified		
5.13.13	Country of origin	to be specified		
5.13.14	Description			
5.13.15	Standard specification applied	IEC, EN		
5.13.16	Type of suspension clamps	to be specified		
5.13.17	Breaking strength of helical dead ends	to be specified		kN
5.13.18	Slipping of helical dead ends	to be specified		kN
5.13.19	ARMOUR RODS			
5.13.20	Manufacturer	to be specified		
5.13.21	Manufacturer's type and reference	to be specified		
5.13.22	Country of origin	to be specified		
5.13.23	Description			
5.13.24	Standard specification applied	IEC, EN		
5.13.25	Type of armour rods	to be specified		
5.13.26	Material of armour rods	to be specified		
5.13.27	Dimension of armour rods	to be specified		
5.13.28	VIBRATION DAMPERS			
5.13.29	Manufacturer	to be specified		
5.13.30	Manufacturer's type and reference	to be specified		
5.13.31	Country of origin	to be specified		
5.13.32	Description			
5.13.33	Standard specification applied	EN 61897		
5.13.34	Type of vibration damper	to be specified		
5.13.35	Weight of vibration damper	to be specified		kg
5.13.36	Type of attachment of vibration damper	to be specified		
5.13.37	Whether all fitting suplied are hot dip galvanised	yes		

5.14. Fittings

Item	Description	Required	Offered	Unit

5.14.1	SUSPENSION FITTINGS FOR ACS			
5.14.2	Manufacturer	to be specified		
5.14.3	Country of origin	to be specified		
5.14.4	Overall length of assembly from tower attachment point to centre of shield wire	to be specified		mm
5.14.5	Minimum failing load of assembly	70		kN
5.14.6	Assembly drawing	to be specified		
5.14.7	TENSION FITTINGS FOR ACS			
5.14.8	Manufacturer	to be specified		
5.14.9	Country of origin	to be specified		
5.14.10	Overall length of assembly from tower attachment to jumper take-off			mm
5.14.11	Minimum failing load of assembly	120		kN
5.14.12	Assembly drawing			
5.14.13	Drawing of bonding arrangement on terminal towers			
5.14.14	SUSPENSION FITTINGS FOR OPGW			
5.14.15	Manufacturer	to be specified		
5.14.16	Country of origin	to be specified		
5.14.17	Overall length of assembly from tower attachment point to centre of shield wire			mm
5.14.18	Minimum failing load of assembly	70		kN
5.14.19	Assembly drawing			
5.14.20	TENSION FITTINGS FOR OPGW			
5.14.21	Manufacturer	to be specified		
5.14.22	Country of origin	to be specified		
5.14.23	Overall length of assembly form tower attachment to jumper take-off			mm
5.14.24	Minimum failing load of assembly	120		kN
5.14.25	Assembly drawing			
5.14.26	Drawing of bonding arrangement on terminal towers			m

Transmission Lines

6. Overhead Line Accessories

6.1. Midspan Joints and Dead-End Fittings for ACSR Bluejay

Item	Description	Required	Offered	Unit
6.1.1	Manufacturer	to be specified		
6.1.2	Country of origin	to be specified		
6.1.3	Minimum slipping strength of Mid-span joint and dead end	conductor RTS		≥95%
6.1.4	Mid-span joint drawing/catalogue nos.	to be specified		
6.1.5	Dead end drawing./catalogue nos.	to be specified		

6.2. Midspan Joints and Dead-End Fittings for ACSR Bison

Item	Description	Required	Offered	Unit
6.2.1	Manufacturer	to be specified		
6.2.2	Country of origin	to be specified		
6.2.3	Minimum slipping strength of Mid-span joint and dead end	conductor RTS		≥95%
6.2.4	Mid-span joint drawing/catalogue nos.	to be specified		
6.2.5	Dead end drawing./catalogue nos.	to be specified		

6.3. Midspan Joints and Dead-End Fittings for ACSR Wolf

Item	Description	Required	Offered	Unit
6.3.1	Manufacturer	to be specified		
6.3.2	Country of origin	to be specified		
6.3.3	Minimum slipping strength of Mid-span joint and dead end	conductor RTS		≥95%
6.3.4	Mid-span joint drawing/catalogue nos.	to be specified		
6.3.5	Dead end drawing./catalogue nos.	to be specified		

6.4. Midspan Joints and Dead-End Fittings for ACSR 95/55

Item	Description	Required	Offered	Unit
6.4.1	Manufacturer	to be specified		
6.4.2	Country of origin	to be specified		
6.4.3	Minimum slipping strength of Mid-span joint and dead end	conductor RTS		≥95%
6.4.4	Mid-span joint drawing/catalogue nos.	to be specified		

6.4.5	Dead end drawing./catalogue nos.	to be specified		

6.5. Midspan Joints and Dead-End Fittings for ACS 7/6 AWG

Item	Description	Required	Offered	Unit
6.5.1	Manufacturer	to be specified		
6.5.2	Country of origin	to be specified		
6.5.3	Minimum slipping strength of Mid-span joint and dead end	conductor RTS		≥95%
6.5.4	Mid-span joint drawing/catalogue nos.	to be specified		
6.5.5	Dead end drawing/catalogue nos.	to be specified		

6.6. Repair Sleeves for Conductor ACSR Bluejay

Item	Description	Required	Offered	Unit
6.6.1	Manufacturer	to be specified		
6.6.2	Country of origin	to be specified		
6.6.3	Repair sleeves drawing /catalogue nos.	to be specified		

6.7. Repair Sleeves for Conductor ACSR Bison

Item	Description	Required	Offered	Unit
6.7.1	Manufacturer	to be specified		
6.7.2	Country of origin	to be specified		
6.7.3	Repair sleeves drawing /catalogue nos.	to be specified		

6.8. Repair Sleeves for Conductor ACSR Wolf

Item	Description	Required	Offered	Unit
6.8.1	Manufacturer	to be specified		
6.8.2	Country of origin	to be specified		
6.8.3	Repair sleeves drawing /catalogue nos.	to be specified		

6.9. Dampers for Conductor ACSR Bluejay

Item	Description	Required	Offered	Unit
6.9.1	Manufacturer	to be specified		
6.9.2	Country of origin	to be specified		
6.9.3	Type	Stockbridge		
6.9.4	Messenger wire type	19		strands
6.9.5	Drawing no. / catalogue no.	to be specified		

6.10. Dampers for Conductor ACSR Bison

Item	Description	Required	Offered	Unit
6.10.1	Manufacturer	to be specified		
6.10.2	Country of origin	to be specified		
6.10.3	Type	Stockbridge		
6.10.4	Messenger wire type	19		strands
6.10.5	Drawing no. / catalogue no.	to be specified		

6.11. Dampers for Conductor ACSR Wolf

Item	Description	Required	Offered	Unit
6.11.1	Manufacturer	to be specified		
6.11.2	Country of origin	to be specified		
6.11.3	Type	Stockbridge		
6.11.4	Messenger wire type	19		strands
6.11.5	Drawing no. / catalogue no.	to be specified		

6.12. Dampers for Conductor ACSR 95/55

Item	Description	Required	Offered	Unit
6.12.1	Manufacturer	to be specified		
6.12.2	Country of origin	to be specified		
6.12.3	Type	Stockbridge		
6.12.4	Messenger wire type	19		strands
6.12.5	Drawing no. / catalogue no.	to be specified		

6.13. Dampers for Conductor ACS 7/6 AWG

Item	Description	Required	Offered	Unit
6.13.1	Manufacturer	to be specified		
6.13.2	Country of origin	to be specified		
6.13.3	Type	Stockbridge		
6.13.4	Messenger wire type	19		strands
6.13.5	Drawing no. / catalogue no.	to be specified		

6.14. Dampers for OPGW similar to ACSR 95/55

Item	Description	Required	Offered	Unit
6.14.1	Manufacturer	to be specified		
6.14.2	Country of origin	to be specified		
6.14.3	Type	Stockbridge		
6.14.4	Messenger wire type	19		strands
6.14.5	Drawing no. / catalogue no.	to be specified		

6.15. Dampers for OPGW similar to ACS 7/6 AWG

Item	Description	Required	Offered	Unit
6.15.1	Manufacturer	to be specified		
6.15.2	Country of origin	to be specified		
6.15.3	Type	Stockbridge		
6.15.4	Messenger wire type	19		strands
6.15.5	Drawing no. / catalogue no.	to be specified		

6.16. Spacers for Conductor ACSR Bluejay

Item	Description	Required	Offered	Unit
6.16.1	Manufacturer	to be specified		
6.16.2	Country of origin	to be specified		
6.16.3	Type	SEMIFLEXIBLE		
6.16.4	Conductor clamp type	to be specified		
6.16.5	Drawing no. / catalogue no.	to be specified		

6.17. Spacers for Conductor ACSR Bison

Item	Description	Required	Offered	Unit
6.17.1	Manufacturer	to be specified		
6.17.2	Country of origin	to be specified		
6.17.3	Type	SEMIFLEXIBLE		
6.17.4	Conductor clamp type	to be specified		
6.17.5	Drawing no. / catalogue no.	to be specified		

6.18. Jumper Spacers for Conductor ACSR Bluejay

Item	Description	Required	Offered	Unit
6.18.1	Manufacturer	to be specified		
6.18.2	Country of origin	to be specified		
6.18.3	Type	Rigid with weight		
6.18.4	Conductor clamp type	to be specified		
6.18.5	Drawing no. / catalogue no.	to be specified		

6.19. Jumper Spacers for Conductor ACSR Bison

Item	Description	Required	Offered	Unit
6.19.1	Manufacturer	to be specified		
6.19.2	Country of origin	to be specified		
6.19.3	Type	Rigid with weight		
6.19.4	Conductor clamp type	to be specified		
6.19.5	Drawing no. / catalogue no.	to be specified		

6.20. Spacer Damper for Conductor ACSR Bluejay (If Proposed)

Item	Description	Required	Offered	Unit
6.20.1	Manufacturer	to be specified		
6.20.2	Country of origin	to be specified		

6.20.3	Type	Spacer Damper		
6.20.4	Conductor clamp type	to be specified		
6.20.5	Drawing no. / catalogue no.	to be specified		

6.21. **Spacer Damper for Conductor ACSR Bison (If Proposed)**

Item	Description	Required	Offered	Unit
6.21.1	Manufacturer	to be specified		
6.21.2	Country of origin	to be specified		
6.21.3	Type	Spacer Damper		
6.21.4	Conductor clamp type	to be specified		
6.21.5	Drawing no. / catalogue no.	to be specified		

6.22. **Bird Diverter for OPGW type ACSR 95/55 (as per Biodiversity Management Plan)**

Item	Description	Required	Offered	Unit
6.22.1	Manufacturer	to be specified		
6.22.2	Country of origin	to be specified		
6.22.3	Type	as per BMP		
6.22.4	Conductor clamp type	to be specified		
6.22.5	Drawing no. / catalogue no.	to be specified		

6.23. **Bird Diverter for Conductor ACSR 95/55 (as per Biodiversity Management Plan)**

Item	Description	Required	Offered	Unit
6.23.1	Manufacturer	to be specified		
6.23.2	Country of origin	to be specified		
6.23.3	Type	as per BMP		
6.23.4	Conductor clamp type	to be specified		
6.23.5	Drawing no. / catalogue no.			

6.24. **Bird Diverter for OPGW type ACS 7/6 AWG (as per Biodiversity Management Plan)**

Item	Description	Required	Offered	Unit
6.24.1	Manufacturer	to be specified		
6.24.2	Country of origin	to be specified		
6.24.3	Type	as per BMP		
6.24.4	Conductor clamp type	to be specified		
6.24.5	Drawing no. / catalogue no.	to be specified		

6.25. **Bird Diverter for Conductor ACS 7/6 AWG (as per Biodiversity Management Plan)**

Item	Description	Required	Offered	Unit
6.25.1	Manufacturer	to be specified		
6.25.2	Country of origin	to be specified		
6.25.3	Type	as per BMP		
6.25.4	Conductor clamp type	to be specified		
6.25.5	Drawing no. / catalogue no.	to be specified		

6.26. **Aircraft Warning Spheres**

Item	Description	Required	Offered	Unit
6.26.1	Manufacturer	to be specified		
6.26.2	Country of origin	to be specified		
6.26.3	Nominal Characteristics			
6.26.4	Diameter	600		mm
6.26.5	Material	FRP		
6.26.6	Colour	Aviation orange (*)		
6.26.7	Weight	to be specified		kg
6.26.8	Fitting type (clamp)	Metal with armour rod		
6.26.9	Material of bolts nuts & washers	Stainless steel, self locking nuts		
6.26.10	Suitability under aeolian vibration	Yes		

(*) or as per Zambia Civil Aviation Authority (ZCAA)

7.

7.1.

Earthing Material

Counterpoise Cable

Item	Description	Required	Offered	Unit
7.1.1	Manufacturer	to be specified by bidder		
7.1.2	Manufacturer's type and reference	to be specified by bidder		
7.1.3	Country of origin	to be specified by bidder		
7.1.4	Description	to be specified by bidder		
7.1.5	Standard specification applied for counterpoise cable	IEC, EN		
7.1.6	Material of counterpoise cable	copper clad steel		
7.1.7	Number of strands in counterpoise cable	to be specified by bidder		nos
7.1.8	Overall diameter of counterpoise cable	minimum 11,5		mm
7.1.9	Coating thickness	to be specified by bidder		µm
7.1.10	Weight of counterpoise cable	to be specified by bidder		kg
7.1.11	Length per drum of counterpoise cable	to be specified by bidder		m
7.1.12	Gross weight per drum of counterpoise cable	to be specified by bidder		kg

7.2.

Counterpoise Compression Joints

Item	Description	Required	Offered	Unit
7.2.1	Manufacturer	to be specified by bidder		
7.2.2	Manufacturer's type and reference	to be specified by bidder		
7.2.3	Country of origin	to be specified by bidder		
7.2.4	Description	to be specified by bidder		
7.2.5	Standard specification applied for counterpoise compression joints	IEC, EN		

7.3.

Clamp or Lug for Connection to Tower Leg

Item	Description	Required	Offered	Unit
7.3.1	Manufacturer	to be specified by bidder		
7.3.2	Manufacturer's type and reference	to be specified by bidder		
7.3.3	Country of origin	to be specified by bidder		
7.3.4	Description	to be specified by bidder		
7.3.5	Standard specification applied for clamp or lug	IEC, EN		
7.3.6	Type of clamp or lug for connection to tower leg	to be specified by bidder		
7.3.7	Suitable diameter to be attached to clamp or lug for connection to tower leg	to be specified by bidder		mm

7.4.

Earth Rods

Item	Description	Required	Offered	Unit
7.4.1	Manufacturer	to be specified by bidder		
7.4.2	Manufacturer's type and reference	to be specified by bidder		
7.4.3	Country of origin	to be specified by bidder		
7.4.4	Description	to be specified by bidder		
7.4.5	Standard specification applied for earth rod	IEC, EN		
7.4.6	Diameter of Rod	minimum 16		mm
7.4.7	Length of Rod	to be specified by bidder		m
7.4.8	Coating thickness	300		µm
7.4.9	Tensile strength	600		kg/mm2
7.4.10	Type of earth rod	Copper		

Transmission Lines

8. Tools and Equipments

8.1 SCHMIDT CONCRETE TEST HAMMER

Item	Description	Required	Unit
8.1.1	Manufacturer	to be specified by bidder	
8.1.2	Manufacturer's type and reference	to be specified by bidder	
8.1.3	Country of origin	to be specified by bidder	
8.1.4	Description	The Schmidt Concrete Test Hanner provides a rapid, non-destructive method for compressive strength estimates of hardened concrete, concrete uniformity determinations and assessment of rock hardness.	
8.1.5	Equipment name	Original Schmidt Concrete Test Hammer, Type N	
8.1.6	Model	HM-75	
8.1.7	Impact Energy	2.207	Nm
8.1.8	Compressive Strength	10 – 70 (1,450 – 10,152 psi)	MPa
8.1.9	Product Dimensions	53 x 356	mm, Dia.xH
8.1.10	Standard specification	EN 13791 ASTM C805	

8.2 ULTRA SONIC PULSE VELOCITY TESTER

Item	Description	Required	Unit
8.2.1	Manufacturer	to be specified by bidder	
8.2.2	Manufacturer's type and reference	to be specified by bidder	
8.2.3	Country of origin	to be specified by bidder	
8.2.4	Description	Ultrasonic Pulse Velocity (UPV) Instruments provide an accurate and reliable means of assessing the quality of concrete.	
8.2.5	Equipment Name	Proceq Pundit 200 UPV Instrument	
8.2.6	Model	CT-130	
8.2.7	Range	0.1 – 7930	µs
8.2.8	Resolution	0.1µs (<793µs), 1µs (>793µs)	
8.2.9	Temperature Range	-10°C - 50°C (Non Charging) Humidity: <95% RH, non condensing	
8.2.10	Memory Capacity	Internal 8 GB Flash memory	
8.2.11	Display	7in color display 800 x 480 pixels	
8.2.12	Power Supply	Lithium Polymer, 3.6V, 14.0Ah	
8.2.13	Product Dimensions	250 x 162 x 62mm, WxDxH	
8.2.14	Estimated Weight	1.36	kg

8.3 REBAR COVER METER

Item	Description	Required	Unit
8.3.1	Manufacturer	to be specified by bidder	
8.3.2	Manufacturer's type and reference	to be specified by bidder	
8.3.3	Country of origin	to be specified by bidder	
8.3.4	Description	Profometer Rebar Diameter and Cover Meters determine the precise location and accurate dimensional measurements of steel reinforcing bars and other metallic embedment in concrete with detection capabilities of up to 185mm maximum depth.	
8.3.5	Equipment Name	Profometer Cover Meter, Pro	
8.3.6	Model	CT-172R	
8.3.7	Cover Measuring Range	Up to 185	mm
8.3.8	Accuracy	4.1	mm
8.3.9	Power Supply	Rechargeable AA Batteries	
8.3.10	Product Dimensions	250 x 130 x 45	mm, WxDxH
8.3.11	Estimated Weight	1.4	kg

8.4 5 Ton hydraulic Petrol Operated Tower Erection Winch

Item	Description	Required	Unit
8.4.1	Manufacturer	to be specified by bidder	
8.4.2	Manufacturer's type and reference	to be specified by bidder	
8.4.3	Country of origin	to be specified by bidder	
8.4.4	Material	Steel	
8.4.5	Engine	Petrol operated	
8.4.6	Type	Hydraulic, cable pulling winch	
8.4.7	Purpose	Tower erection portable winch	
8.4.8	Speed	Fast	
8.4.9	Tonnage	5	tonne
8.4.10	Running Mode	Moving	
8.4.11	Standard	IEC 60034	
8.4.12	Rope Capacity	110	m
8.4.13	Rope Speed	0-35	m/min
8.4.14	Planetary Reduction Ratio	I=5	
8.4.15	Pull	50	kN
8.4.16	Working Pressure	20	Mpa
8.4.17	Motor	400cc	
8.4.18	Rope Diameter	16	mm
8.4.19	Oil Flow Supply	120	L/min
8.4.20	Carrying Capacity	Weight Level	

8.5 Single-Phase Gen-Welder Machine

Item	Description	Required	Unit
8.5.1	Manufacturer	to be specified by bidder	
8.5.2	Manufacturer's type and reference	to be specified by bidder	
8.5.3	Country of origin	to be specified by bidder	
8.5.4	Description	MMA (Manual Metal Arc) and Scratch Start TIG welding	
8.5.5	Engine	Honda GX390, 8.2kW, 11HP, air-cooled, 4-stroke petrol	
8.5.6	Alternator	Sincro 230V, 50Hz	
8.5.7	Fuel Tank Capacity	6.1 liters	
8.5.8	Max Output	7kVA / 200A welding output	kVA/A
8.5.9	Continuous Run Time	Approx. 2 hours	
8.5.10	Starting System	Recoil (rope) and Electric (key)	
8.5.11	Noise Level	~85 dB	
8.5.12	Weight	~105 kg (dry)	
8.5.13	Oil Alert System	Yes	
8.5.14	Voltage	Single-phase 220V	
8.5.15	Weilding current range	20–200A	
8.5.16	Duty Cycle	60% at full output	

8.6 Three-phase Gen-welder machine

Item	Description	Required	Unit
8.6.1	Manufacturer	to be specified by bidder	
8.6.2	Manufacturer's type and reference	to be specified by bidder	
8.6.3	Country of origin	to be specified by bidder	
8.6.4	Description	MMA (Manual Metal Arc) and Scratch Start TIG welding	
8.6.5	Engine	Kohler® OHV Command® CH23S, 23 HP	
8.6.6	Welding Output Range	AC: 50–225 A DC: 50–210 A CV: 15–25 V	
8.6.7	Generator Output	3-Phase: 11,500W peak / 10,500W continuous	
8.6.8	Processes Supported	Stick, TIG, MIG, Flux-Cored, Gouging	
8.6.9	Fuel Capacity	Not specified	
8.6.10	Weight	~244 kg	
8.6.11	Dimensions (mm)	770 x 485 x 1074	
8.6.12	Input Voltage:	480V 3-phase AC	
8.6.13	Duty Cycle:	100% at rated output	
8.6.14	Electrode Compatibility:	AWS E7018, E6010 and others	
8.6.15	Cooling System:	Air-cooled engine with superior airflow design	

8.6.16	Noise Level:	Engine orientation reduces sound for quieter operation	

8.7 6 Tonne Chain Blocks

Item	Description	Required	
8.7.1		HSH 3/4	
8.7.2	Lifting capacity (t)	0.7	
8.7.3	Lift height (m)	1.5	
8.7.4	testing load (t)	1.125	
8.7.5	The minimum distance between the two hooks(mm)	303	
8.7.6	The effonequired to lift of full loading(kgf)	20	
8.7.7	Number or falls	1	
8.7.8	Diameter of load chain (mm)	6	
8.7.9	The handle length(mm)	290	
8.7.10	Less Net weight(kg)	7	
8.7.11		HSH 3/2	
8.7.12	Lifting capacity (t)	1.5	
8.7.13	Lift height (m)	1.5	
8.7.14	testing load (t)	2.25	
8.7.15	The minimum distance between the two hooks(mm)	365	
8.7.16	The effonequired to lift of full loading(kgf)	21	
8.7.17	Number or falls	1	
8.7.18	Diameter of load chain (mm)	7	
8.7.19	The handle length(mm)	410	
8.7.20	Less Net weight(kg)	11	
8.7.21		HSH3	
8.7.22	Lifting capacity (t)	3	
8.7.23	Lift height (m)	1.5	
8.7.24	testing load (t)	4.5	
8.7.25	The minimum distance between the two hooks(mm)	485	
8.7.26	The effonequired to lift of full loading(kgf)	33	
8.7.27	Number or falls	1	
8.7.28	Diameter of load chain (mm)	10	
8.7.29	The handle length(mm)	410	
8.7.30	Less Net weight(kg)	20	
8.7.31		HSH6	
8.7.32	Lifting capacity (t)	6	
8.7.33	Lift height (m)	1.5	
8.7.34	testing load (t)	7.5	
8.7.35	The minimum distance between the two hooks(mm)	600	
8.7.36	The effonequired to lift of full loading(kgf)	35	
8.7.37	Number or falls	2	
8.7.38	Diameter of load chain (mm)	10	
8.7.39	The handle length(mm)	410	
8.7.40	Less Net weight(kg)	30	

8.8 Live Line Tester up to 330kV HIGH VOLTAGE DETECTORS CABLE TO DETECT VOLTAGE UP TO 500kV

Item	Description	Required	Unit
8.8.1	Type	Electronic capacitive Contact to be used with insulated switching stick with universal tool end. The insulated stick should be rated up to 330kV	kV
8.8.2	Operating Voltage Range	Phase to Phase 220/330 kV switchable	kV
8.8.3	Indication	Double Signaling; extremely bright red light signifying presence of voltage and powerful rated audible signal >60dB/2metres	
8.8.4	Self-Testing	Test Button when pressed a timed green LED lights to indicate detector is operational and the self-testing of the unit continues	
8.8.5	Power supply	Rechargeable Battery	V
8.8.6	End Fitting	Universal Stick type	
8.8.7	Contact Electrode	Vee-shaped and removable	
8.8.8	Construction	Housing made of polycarbonate with high mechanical properties and dielectric strength	
8.8.9	Operating Temperature	-1 to 40 degrees Celsius 80% RH	°C
8.8.10	Storage Temperature	-5 to 40 degrees Celsius	°C
8.8.11	Altitude above sea level	1400	M
8.8.12	Supplied with	Carrying case, Batteries and two contact electrodes	
8.8.13	Weight	0.5 Kilogrammes with batteries or less	Kg

8.8.14	Applicable Standard	IEC/BS/SANS/EN	
8.8.15	Previous Type test Report	to be provided with bid	Yes/No
8.8.16	Routine Tests Certificate	to be provided on delivery	Yes/No

8.9 HIGH FREQUENCY EARTH RESISTANCE MEASURING INSTRUMENT DIGITAL GROUND TESTER

Item	Description	Required	Unit
8.9.1	Description	Portable Preciohm Tower Footing Earth Resistance Tester suitable for testing of earth resistance and resistivity for Towers, substations and power stations.	
8.9.2	Make	Taurus Preziohm TFR Digital Earth Resistance Meter or Equivalent	
8.9.3	Tower Footing Earth Resistance Test Ranges	0.01Ω – 20kΩ	Ω
8.9.4	Measurement Accuracy	+/-2%	%
8.9.5	Principal of Operation	Fall of Potential (3 point) for earth resistance and wenner (4 point) for earth resistivity.	
8.9.6	Test Frequency	128 ±0.5 and Variable	Hz
8.9.7	Voltage output	250V	V
8.9.8	Constant Current Output	60mA to override the noise in the power station environment.	
8.9.9	Test Current	Bidder to state	mA
8.9.10	Short Circuit Current	60	mA
8.9.11	Memory	Must be capable of Automatic storage of 1000 results.	
8.9.12	Display	Graphic LCD display to enable quick and user-friendly operation.	
8.9.13	Power frequency and Harmonics	Must be Immune.	
8.9.14	IP rating	IP67	
8.9.15	Battery type	Rechargeable Li-ion battery for long hours of use (at least for 8hrs continuous use).	
8.9.16	Voltage Withstand	250 V a.c. between any two terminals	V
8.9.17	Flash Test	Tested to 2.3 kV r.m.s.	V
8.9.18	Weight	<7kgs	Kg
8.9.19	PC Interface (Optional)	Available	
8.9.20	Environmental Conditions		
8.9.21	Altitude above sea level	1400	m
8.9.22	Humidity	95% relative humidity max. at 50°C	%
8.9.23	Operating Temperature	0 to 50°C	°C
8.9.24	Storage temperature range	0°C to +70°C	°C
8.9.25	Accessories		
8.9.26	Charging Adapter	1	Nos
8.9.27	Pegs	3	Nos
8.9.28	25m Cable (Red Colour)	1	Nos
8.9.29	15m Cable (Yellow Colour)	1	Nos

8.10 Leica Total Station LS10

Item	Description	Required	Unit
8.10.1	HEIGHT MEASUREMENT		
8.10.2	Accuracy1 using standard Invar staff	0.3	mm
8.10.3	Accuracy2 using standard staff	1.0	mm
8.10.4	DISTANCE MEASUREMENT		
8.10.5	Accuracy3	15	mm at 30 m
8.10.6	MEASUREMENT RANGE		
8.10.7	Minimum range	1.8	m
8.10.8	Maximum range4	110	m
8.10.9	Measurement time	Typically 2.5	sec
8.10.10	AUTOFOCUS		
8.10.11	Working range	X	
8.10.12	Time to focus	X	
8.10.13	OVERVIEW CAMERA		
8.10.14	Field of view	X	
8.10.15	Frame rate	X	
8.10.16	Focus	X	
8.10.17	DIGITAL COMPASS		
8.10.18	Accuracy6	X	
8.10.19	COMPENSATOR		

8.10.20	Working range	± 9	'
8.10.21	Accuracy ⁶	0.3	"
8.10.22	Magnetic field sensitivity ⁵	≤ 1	"
8.10.23	INTERFACES		
8.10.24	RS232 / USB	X	
8.10.25	Bluetooth®	✓	
8.10.26	Mini USB	✓	
8.10.27	DATA STORAGE		
8.10.28	Internal memory	30	measurements
8.10.29	USB stick	Yes	
8.10.30	GENERAL		
8.10.31	Display	3.6 inches, QVGA, colour, touch	-
8.10.32	Telescope magnification	32 x	times
8.10.33	Minimum focusing distance	0.6	m
8.10.34	Electronic level bubble (Longitudinal and Transversal tilt) Working range	± 9	foot
8.10.35	Weight (including battery)	3.7	kg
8.10.36	Internal battery / operating time	Exchangeable Lithium-Ion / 12 h	-
8.10.37	External power	X	
8.10.38	ENVIRONMENTAL SPECIFICATIONS		
8.10.39	Working temperature range	-20 to +50	°C
8.10.40	Dust / Water (IEC 60529)	IP55	-
8.10.41	Humidity	95%, non-condensing	%

8.11. **Leica Total Station LS15**

Item	Description	Required	Unit
8.11.1	HEIGHT MEASUREMENT		
8.11.2	Accuracy ¹ using standard Invar staff	0.2; 0.3	mm
8.11.3	Accuracy ² using standard staff	1.0	mm
8.11.4	DISTANCE MEASUREMENT		
8.11.5	Accuracy ³	15 mm at 30 m	
8.11.6	MEASUREMENT RANGE		
8.11.7	Minimum range	1.8	m
8.11.8	Maximum range ⁴	110	m
8.11.9	Measurement time	Typically 2.5	Sec
8.11.10	AUTOFOCUS		
8.11.11	Working range	1.8 m to infinity	
8.11.12	Time to focus	Typically 4	sec
8.11.13	OVERVIEW CAMERA		
8.11.14	Field of view	6° x 4.8° (7.7° diagonal)	"
8.11.15	Frame rate	Up to 20	nos/s
8.11.16	Focus	3 m to infinity	
8.11.17	DIGITAL COMPASS		
8.11.18	Accuracy ⁶	3 gon / 2.7°	
8.11.19	COMPENSATOR		
8.11.20	Working range	± 9'	'
8.11.21	Accuracy ⁶	0.3"	"
8.11.22	Magnetic field sensitivity ⁵	≤ 1"	"
8.11.23	INTERFACES		
8.11.24	RS232 / USB	✓	
8.11.25	Bluetooth®	✓	
8.11.26	Mini USB	✓	
8.11.27	DATA STORAGE		
8.11.28	Internal memory	30	measurements

8.11.29	USB stick	Yes	
8.11.30	GENERAL		
8.11.31	Display	3.6 inches, QVGA, colour, touch	
8.11.32	Telescope magnification	32 x	times
8.11.33	Minimum focusing distance	0.6	m
8.11.34	Electronic level bubble (Longitudinal and Transversal tilt)	Working range 0.1100 gon / 0.099° Accuracy6 0.015 gon / 0.013°	
8.11.35	Weight (including battery)	3.9	kg
8.11.36	Internal battery / operating time	Exchangeable Lithium-Ion / 10 - 12	h
8.11.37	External power	12.8 V DC (10.5-18 V)	
8.11.38	ENVIRONMENTAL SPECIFICATIONS		
8.11.39	Working temperature range	-20 to +50	°C
8.11.40	Dust / Water (IEC 60529)	IP55	
8.11.41	Humidity	95%, non-condensing	%

8.12. Leica TS16

Item	Description	Required	Unit
8.12.1	ANGLE MEASUREMENT		
8.12.2	Accuracy ¹ Hz and V	Absolute, continuous, diametrical	1'' (0.3 mgon), 2'' (0.6 mgon), 3'' (1 mgon), 5'' (1.5 mgon)
8.12.3	DISTANCE MEASUREMENT		
8.12.4	Range ²	Prism (GPR1, GPH1P) ³ Non-Prism / Any surface ^{4,9}	0.9 m to 3,500 m
8.12.5			R500: 0.9 m to >500 m
8.12.6			R1000: 0.9 m to >1,000 m
8.12.7	Accuracy / Measurement time	Single (prism) ^{2,5}	1 mm + 1.5 ppm / typically 2.4 s
8.12.8		Single (prism fast) ^{2,5}	2 mm + 1.5 ppm / typically 1.5 s ¹¹
8.12.9		Single (any surface) ^{2,4,5,6}	2 mm + 2 ppm / typically 2 s ⁷
8.12.10	Laser dot size	At 50 m	8 mm x 20 mm
8.12.11	Measurement technology	System analyser	Coaxial, visible red laser
8.12.12	IMAGING		
8.12.13	Overview camera	Sensor	5 megapixel CMOS sensor
8.12.14		n Field of view	19.4°
8.12.15		n Frame rate	Up to 20 frames per second
8.12.16	AUTOMATIC AIMING - ATRplus		
8.12.17	Target aiming range ² / Target locking range ²	Circular prism (GPR1, GPH1P)	1,500 m / 1,000 m
8.12.18		360° prism (GRZ4, GRZ122)	1,000 m / 1,000 m
8.12.19	Accuracy ^{1,2} / Measurement time	ATRplus angle accuracy Hz, V	1'' (0.3 mgon), 2'' (0.6 mgon), 3'' (1 mgon),
8.12.20			5'' (1.5 mgon) / typically 3-4 s
8.12.21	LASER GUIDE		
8.12.22	Spot Size ⁸ / Range	Daylight: 30 mm @250 m	250 m
8.12.23		Darkness: 65 mm @300 m	500 m
8.12.24	POWERSEARCH		
8.12.25	Range / Search time	360° prism (GRZ4, GRZ122)	300 m / typically 5 s
8.12.26	GUIDE LIGHT (EGL)		
8.12.27	Working range / Accuracy	5 - 150 m / typically 5 cm @ 100 m	
8.12.28	GENERAL		
8.12.29	Operating System / Field Software	Windows EC7 / Leica Captivate with apps	
8.12.30	Processor	TI OMAP4430 1GHz Dual-core ARM® Cortex™-A9 MPCore™	
8.12.31	AutoHeight module for automatic	Distance accuracy	1.0 mm (1 Sigma)
8.12.32	instrument height measurement	Distance range	0.7 m to 2.7 m
8.12.33	Display and keyboard	5'' (inch), WVGA, colour, touch, face I standard /	37 keys, illumination
8.12.34		face II optional	

8.12.35	Power management	Exchangeable Lithium-Ion battery	Operating time up to 8 h
8.12.36	Data storage	Internal memory / Memory card	2 GB / SD card 1 GB or 8 GB
8.12.37	Interfaces	RS232, USB, Bluetooth®, WLAN	
8.12.38	Weight	Total station including battery	5.1 - 5.8 kg
8.12.39	Environmental specifications	Working temperature range	–20°C to +50°C
8.12.40		Dust & Water (IEC 60529) / Humidity	IP55 / 95%, non-condensing

8.13. DRONE

Item	Description	Required	Unit
8.13.1	MATRICE 350 RTK AIRCRAFT		
8.13.2	Dimensions:	810×670×430 mm [Unfolded, propellers excluded]	
8.13.3		430×420×430 mm [Folded, propellers included]	
8.13.4	Diagonal Wheelbase:	895 mm	
8.13.5	Single Gimbal Damper’s Max Payload:	960 g	
8.13.6	Operating Frequency:	2.400 GHz - 2.483 GHz	
8.13.7		5.150 GHz - 5.250 GHz (CE: 5.150 GHz - 5.250 GHz)	
8.13.8		5.725 GHz - 5.850 GHz	
8.13.9	Hovering Accuracy: (P-mode with GPS)	Vertical:	
8.13.10		±0.1 m (Vision System enabled)	
8.13.11		±0.5 m (GPS enabled)	
8.13.12		±0.1 m (RTK enabled)	
8.13.13		Horizontal:	
8.13.14		±0.3 m (Vision System enabled)	
8.13.15		±1.5 m (GPS enabled)	
8.13.16		±0.1 m (RTK enabled)	
8.13.17	Max Ascent Speed	6 m/s	
8.13.18	Max Speed	23 m/s	
8.13.19	Max Flight Altitude: Above Sea Level	5 000 m [with 2110 propellers, take-off weight ≤ 7.4 kg]	
8.13.20		7 000 m [with 2112 propellers, take-off weight ≤ 7.2 kg]	
8.13.21	Supported Gimbal Configurations:	Single Downward Gimbal, Dual Downward Gimbals,	
8.13.22		Single Downward + single upward gimbal,	
8.13.23		Dual Downward + single upward gimbal	
8.13.24	Max Take-off Weight:	9,2 kg	
8.13.25	Weight:	without batteries ± 3.77 kg	
8.13.26		with 2x TB65 batteries ± 6.47 kg	
8.13.27	Transmission Power (EIRP)	2.4000 - 2.4835 GHz:	
8.13.28		< 33 dBm FC	
8.13.29		< 20 dBm CE/SRRC/MIC	
8.13.30		5.150 - 5.250 GHz	
8.13.31		<23 dBm CE	
8.13.32		5.725 - 5.850 GHz	
8.13.33		<33 dBm FCC/SRRC	
8.13.34		<14 dBm CE	
8.13.35	RTK Positioning Accuracy: (When RTK enabled and fixed)	1cm + 1ppm Horizontal	
8.13.36		1.5cm + 1ppm Vertical	
8.13.37	Max Angular Velocity:	Pitch: 300°/s Yaw: 100°/s	
8.13.38	Max Pitch Angle:	30° N-model	
8.13.39		25° Forward Vision System enabled	
8.13.40	Max Decent Speed:	Vertical: 5 m/s	

8.13.41		Tilt: 7 m/s	
8.13.42	Max Wind Resistance:	12 m/s	
8.13.43	Max Flight Time:	55 min	
8.13.44	Supported DJI Gimbals:	Zenmuse H20 / H20T / H20N / P1 / L1	
8.13.45	Environmental Rating:	IP55	
8.13.46	GNSS:	GPS+GLONASS+BeiDou+Galileo	
8.13.47	Operating Temperature:	-20° to 50°C	
8.13.48	REMOTE CONTROLLER		
8.13.49	Screen:	7.02-inch LCD touchscreen	
8.13.50		Resolution: 1920×1200	
8.13.51		Max brightness: 1200 nits	
8.13.52	Weight:	Approx. 1.25 kg (without WB37 battery)	
8.13.53		Approx. 1.42 kg (with WB37 battery)	
8.13.54	Global Navigation Satellite System:	GPS+Galileo+BeiDou	
8.13.55	Ingress Protection Rating:	IP54	
8.13.56	External WB37 Intelligent Battery:	Capacity: 4920 mAh	
8.13.57		Voltage: 7.6V	
8.13.58		Type: Li-on	
8.13.59		Energy: 37.39Wh	
8.13.60		Chemical System: LiCoO ₂	
8.13.61	Built-in battery:	Type: Li-on (6500 mAh @ 7.2 V)	
8.13.62		Charging Type: Battery station or USB-C fast charger max 65W / 20V	
8.13.63		Charging time: 2 HRS	
8.13.64		Chemical System: LiNiCoAlO ₂	
8.13.65	Operating Frequency:	2.400 GHz to 2.483 GHz	
8.13.66		5.725 GHz to 5.850 GHz	
8.13.67	Transmission Power (EIRP)	2.4000 - 2.4835 GHz:	
8.13.68		< 33 dBm FCC	
8.13.69		< 20 dBm CE/SRRC/MIC	
8.13.70		5.725 - 5.850 GHz	
8.13.71		<33 dBm FCC	
8.13.72		<14 dBm CE	
8.13.73		< 23 dBm SRRC	
8.13.74	Wi-Fi Protocol:	Wi-Fi 6	
8.13.75	Wi-Fi Operating Frequency:	2.4000-2.4835 GHz	
8.13.76		5.150-5.250 GHz	
8.13.77		5.725-5.850 GHz	
8.13.78	Bluetooth Protocol:	Bluetooth 5.1	
8.13.79	Bluetooth Frequency:	2.4000-2.4835 GHz	
8.13.80	Operating Time:	Built-in battery: ± 3.3 hrs	
8.13.81		Built-in battery + Ext battery: ±6 hrs	
8.13.82	Operating Temperature:	-20° to 50°C	
8.13.83	VIDEO TRANSMISSION		
8.13.84	Video Transmission System:	DJI O3 Enterprise Transmission	
8.13.85	Antenna:	4 video transmission antennas, 2T4R	
8.13.86	Max Transmission Distance	Un-obstructed, free of interference: 20 km (FCC) 8 km (CE/SRRC/MIC)	
8.13.87		With interference: Low Interference and Obstructed by Buildings: approx. 0-0.5 km	
8.13.88		Low Interference and Obstructed by Trees: approx. 0.5-3 km	
8.13.89		Strong Interference and Unobstructed: urban landscape, approx. 1.5-3 km	
8.13.90		Medium Interference and Unobstructed: suburban landscape, approx. 3-9 km	

8.13.91		Low Interference and Unobstructed: suburb/seaside, approx. 9-20 km	
8.13.92	VISION SYSTEM		
8.13.93	Obstacle Sensing Range	Forward/Backward/Left/Right: 0.7-40m	
8.13.94		Upward/Downward: 0.6-30m	
8.13.95	FOV:	Forward/Backward/Downward: 65° (H) / 50° (V)	
8.13.96		Left/Right/Upward: 75° (H) / 60° (V)	
8.13.97	Operating Environment:	Surfaces with clear patterns and adequate lighting (> 15 lux	
8.13.98	INFRARED SENSING SYSTEM		
8.13.99	Obstacle Sensing Range:	0.1 - 8m	
8.13.100	Field of View:	30° (± 15°)	
8.13.101	Operating Environment:	Large, diffuse and reflective obstacles (reflectivity >10%)	
8.13.102	LED AUXILIARY LIGHT		
8.13.103	Effective lighting distance:	5m	
8.13.104	Illumination Type:	60Hz, solid glow	
8.13.105	FPV CAMERA		
8.13.106	Resolution:	10800P	
8.13.107	Field of View:	142°	
8.13.108	Frame Rate	30fps	
8.13.109	INTELLIGENT FLIGHT BATTERY (TB65)		
8.13.110	Capacity:	5880 mAh	
8.13.111	Voltage Energy:	11.76 V 263.2 Wh	
8.13.112	Battery Type:	Li-on	
8.13.113	Charging Temperature:	-20° to 40°C	
8.13.114	Operating Temperature:	-20° to 50°C	
8.13.115	Charging Time:	Using BS65 220V Intelligent Battery Station	
8.13.116		60 MIN (fully charging two TB65 batteries)	
8.13.117		30 MIN (charging two TB65 batteries from 20% to 90%)	
8.13.118	INTELLIGENT BATTERY STATION		
8.13.119	Dimensions:	580 x358 x 254mm	
8.13.120	Compatible Stored Items:	TB65 Intelligent Flight Battery × 8	
8.13.121		WB37 Intelligent Battery × 4	
8.13.122	Input:	220-240 VAC, 50-60 Hz	
8.13.123	Net Weight:	8.98kg	
8.13.124	Operating Temperature:	-20°C to 40°C	
8.13.125	Max. Input Power	1070 W	
8.13.126	Output Power:	220-240 V: 992 W	

8.14. LEICA GS 18T

Item	Description	Required	
8.14.1	GNSS TECHNOLOGY		
8.14.2	Self-learning GNSS	Leica RTKplus	Adaptive on-the-fly satellite selection
		SmartLink (worldwide correction service)	Remote precise point positioning (3 cm 2D) ¹
		SmartLink fill (worldwide correction service)	Initial convergence to full accuracy 20 - 40 min, Re-convergence < 1 min
			Bridging of RTK outages up to 10 min (3 cm 2D)
8.14.3	Leica SmartCheck	Continuous check of RTK solution	Reliability 99.99%
8.14.4	Signal tracking		GPS (L1, L2, L2C, L5), Glonass (L1, L2, L2C, L32), BeiDou (B1, B2, B32), Galileo (E1, E5a, E5b, Alt-BOC, E62),

			QZSS (L1, L2C, L5, L62), NavIC L53, SBAS (WAAS, EGNOS, MSAS, GAGAN), L-band
0.14.5	Number of channels		555 (more signals, fast acquisition, high sensitivity)
8.14.6	Tilt compensation	Increased measurement productivity and traceability	Calibration-free Immune to magnetic disturbances
8.14.7	MEASUREMENT PERFORMANCE & ACCURACY¹		
8.14.8	Time for initialisation		Typically 4 s
8.14.9	Real-time kinematic	Single baseline	Hz 8 mm + 1 ppm / V 15 mm + 1 ppm
8.14.10	(Compliant to ISO17123-8 standard)	Network RTK	Hz 8 mm + 0.5 ppm / V 15 mm + 0.5 ppm
8.14.11	Real-time kinematic tilt compensated	Topographic points (not for static control points)	Additional Hz pole tip uncertainty typically less than 8 mm + 0.4 mm/° tilt down to 30° tilt
8.14.12	Post processing	Static (phase) with long observations	Hz 3 mm + 0.1 ppm / V 3.5 mm + 0.4 ppm
		Static and rapid static (phase)	Hz 3 mm + 0.5 ppm / V 5 mm + 0.5 ppm
8.14.13	Code differential	DGPS / RTCM	Typically 25 cm
8.14.14	COMMUNICATIONS		
8.14.15	Communication ports	Lemo	USB and RS232 serial
		Bluetooth®	Bluetooth® v2.1 + EDR, class 1.5
8.14.16	Communication protocols	RTK data protocols	Leica, Leica 4G, CMR, CMR+, RTCM 2.2, 2.3, 3.0, 3.1, 3.2 MSM
		NMEA output	NMEA 0183 v4.00 and Leica proprietary
		Network RTK	VRS, FKP, iMAX, MAC (RTCM SC 104)
8.14.17	Built-in data links	GSM / UMTS / LTE phone modem	Fully integrated, external antenna
		Radio modem	Fully integrated, receive and transmit, external antenna
			403 - 470 MHz, 1 W output power, up to 28800 bps over air
8.14.18	External data links		GSM / GPRS / UMTS / LTE / CDMA and UHF / VHF modem
8.14.19	GENERAL		
8.14.20	Field controller and software	Leica Captivate software	Leica CS20 field controller, Leica CS35 tablet
8.14.21	User interface	Buttons and LEDs	On / Off and Function button, 8 status LEDs
		Web server	Full status information and configuration options
8.14.22	Data recording	Storage	Removable SD card, 8 GB
		Data type and recording rate	Leica GNSS raw data and RINEX data at up to 20 Hz
8.14.23	Power management	Internal power supply	Exchangeable Li-Ion battery (2.8 Ah / 11.1 V)
		External power supply	Nominal 12 V DC, range 10.5 - 26.4 V DC
		Operation time ⁴	7h receiving (Rx) data with internal radio, 5 h transmitting (Tx) data with internal radio, 6 h Rx/Tx data with internal phone modem
8.14.24	Weight and dimensions	Weight	1.20 kg / 3.50 kg standard RTK rover setup on pole
		Dimensions	173 mm x 173 mm x 108 mm
8.14.25	Environmental	Temperature	-40 to 65°C operating, -40 to 85°C storage
		Drop	Withstands topple over from a 2 m survey pole onto hard surfaces
		Proof against water, sand and dust	IP66 / IP68 (IEC60529 / MIL STD 810G CHG-1 510.6 I / MIL STD 810G CHG-1 506.6)
		Vibration	Withstands strong vibration (ISO9022-36-08 / MIL STD 810G 514.6 Cat.24)
		Humidity	95% (ISO9022-13-06 / ISO9022-12-04 / MIL STD 810G CHG-1 507.6 II)
		Functional shock	40 g / 15 to 23 msec (MIL STD 810G 516.6 I)

8.15. Special Tools for Euphorbia Critical Habitat

Item	Description	Required	Remark, Unit
8.15.1	Gin-Pole System (Modular Tower-Mounted Derrick)		
8.15.2	Safe Working Load (SWL)	>= 20 ton	At 2.5m radius; proof-load test at 125% of SWL with Certificate
8.15.3	Lift Height	>= 70m	To reach 60m-class tower peak with reeving allowance.
8.15.4	Sections	=< 1.5m	Modular aluminum or high-strength steel poles up to 1.5m length; max single component mass is up to 35kg to permit manual portorage within buffer
8.15.5	Guying	3 or 4 way guy arrangement with adjustable anchors	Anchors rated >= 2x maxium line pull: Anchors slings to EN795-B or equivalent.
8.15.6	Hoisting Gear	Double-sheave traveling block compatible with rope diameter 12 - 16 mm	Sheve D/d ratio >=20 for OPGW to limit bend fatigue.
8.15.7	Breaks & Anti-rollback	Yes	Positive load-holding breake; Anti-two-block protection.
8.15.8	On-Tower interface	Must clamp to angle members per the bidder's design (e.g., from 50mm to 150mm)	Clamp / Brace for 330SPEC Tower
8.15.9	Materials	Bidder to specify	Aluminum 6000 series anodized or steel S355 hot-dip galvanized; fastners A4-70/A-4-80 or equivalent; Shaves with replaceable bushings.
8.15.10	Standards	Bidder to specify	Hand/Electric lifting equipment EN 13157 (manual hoists), EN 14492-2 (power driven hoists where applicable), lifting accessories to EN 1677; hooks with safety latches (ASME B30.10 equivalent). Fall-arrester anchor points to EN795; Method of Statement to align with "Manual Erection" constraint for the Euphorbia area.
8.15.11	General		
8.15.12	Portability and Manual logistics	Mass =< 35kg; length =< 1.5m	

8.15.13	Submittals	Yes	Data sheet; GA drawings; calibration certificates (where applicable); proof-/type-test certificates; inspection check lists; Manual/Instruction for safe operation, mainteance, calibration and storage.
8.15.14	Spare parts & Consumables	Yes	At least: Sheaves/bushings; brake pads; load cells (where applicable); bearings, rope end-terminations.
8.15.15	ESHS Constraints	Yes	Noise, spill control, and footprint minimization should meet the maunal erection mandated in the Euphorbia segment.

8.16	OPTICAL FIBRE FUSION SPLICING (OPTIC FIBRE JOINING) MACHINE		
Item	Description	Required	Remark, Unit
8.16.1	Fibre alignment mode	Active core alignment	
8.16.2	Applicable fibre - Fibre type	Single mode	
		Multi-mode	
8.16.3	Applicable coating – sheath clamp	Coating diameter: 3000µm	
		Cleave length: 5mm – 16mm	
8.16.4	Fibre splice performance – splice loss	ITU-T G.652: avg. 0.02 dB	
		ITU-T G.651: avg. 0.01 dB	
		ITU-T G.653: avg. 0.04 dB	
		ITU-T G.655: avg. 0.04 dB	
		ITU-T G.657: avg. 0.02 dB	
8.16.5	Fibre splice performance – Splice time	SM FAST mode: avg. 7 – 9 sec	
		AUTO mode: avg. 14 – 16 sec	
8.16.6	Sleeve type	Heat shrinkable sleeve	
8.16.7	Sleeve length	Max. 66 mm	
8.16.8	Sleeve diameter	Max. 6.0 mm before shrinking	
8.16.9	Sleeve heat performance – Heat time	60mm slim mode: avg. 9 -10sec	
		60mm mode: avg. 13 – 15 sec	
8.16.10	Fibre tensile test force	Approximately 2.0 N	
8.16.11	Electrode life	5000+	
8.16.12	Dimensions (W x D x H)	Within (170 x 173 x 150) mm	
8.16.13	Weight	Within 2.8 kg (with battery)	
8.16.14	Environmental Conditions - Temperature	Operate: -10°C - +50°C	
		Storage: -40°C - +80°C	
8.16.15	Environmental Conditions - Humidity	Operate: 0% - 95% RH non-condensing	
		Storage: 0% - 95% RH non-condensing	
8.16.16	AC adaptor - Input	AC 100 to 240V, 50/60Hz max. 1.5 A	
8.16.17	Battery type	Rechargeable lithium-ion	
8.16.18	Battery output	Approx. DC 14.4V/6,380 mAh	
8.16.19	Battery capacity	Approx. 300 splice & heat cycles	
8.16.20	Battery Temperature	Recharge: 0°C - 40°C	
		Storage: -20°C - +30°C	
8.16.21	Battery life	Approx. 500 recharge cycles	
8.16.22	Display - LC monitor	TFT 5 inches with touch screen	
8.16.23	Display - Magnification	200 to 300x	
8.16.24	Illumination – V-grooves	LED lamp	
8.16.25	Interface - PC	USB2.0 Mini B type	
8.16.26	Interface- External LED lamp	USB2.0 A type, approx. DC 5V, 500mA	
8.16.27	Interface – Ribbon stripper	Mini DIN 6 pin, DC 12V, max. 1A	
8.16.28	Interface - Wireless	Bluetooth 4.1 LE	
8.16.29	Data storage – Splice mode	100 splice modes	
8.16.30	Data storage – Heat mode	30 heat modes	
8.16.31	Data storage – Splice result	20000 splices	
8.16.32	Data storage – Slice image	100 images	
8.16.33	Screw hole for tripod	¼ -20UNC	
8.16.34	Other features – Automatic functions	Splice mode select by fibre type analysis	
		Discharge power calibration	
		Wind protector: open/close	

		Sheath clamp: open	
		Heater lid: open/close	
		Heater clamp: open/close	
8.16.35	Reference guide	Video and PDF file store in splicer	
8.16.36	Sheath clamp	Easy sleeve positioning clamp	
8.16.37	Electrode	Replaceable without tool	
8.16.38	Cleaver/Stripper/Alcohol Dispenser	Set/Lot	

8.17

Optical Time-Domain Reflectometer (OTDR)

Item	Description	Required	Remark, Unit
8.17.1	Dimensions	270 (W) × 165 (H) × 61 (D) mm	
8.17.2	Mass (without protection)	Without battery 1.6 kg, 1.9 kg including battery	
8.17.3	Mass (with protection)	2.6 kg including battery	
8.17.4	Display	8-inch touch screen TFT-Colour LCD	
8.17.5	Interface	USB 1.1, Type A × 1 (memory), Type B × 1 (USB mass storage)	
8.17.6	Data Storage	Internal memory: Not less than1 GB (50,000 traces), External memory (USB): up to 32 GB	
8.17.7	Power Supply	12 V(dc), 100 V(ac) to 240 V(ac), Allowable input voltage range: 90 V to 264 V, 50 Hz/60 Hz	
8.17.8	Battery	Type: Lithium-ion Operating Time: 12 hours, Telcordia GR-196-CORE Recharge Time: <5 hours (power off)	
8.17.9	Power Saving Functions	Backlight off: Disable/1 to 99 minutes Auto shutdown: Disable/1 to 99 minutes	
8.17.10	Power Consumption	20W max (recharging), 4W standard (low backlight, sweep stopped)	
8.17.11	Vertical Scale	0.13, 0.33, 0.65, 1.3, 3.25, 6.5, 13 dB/div	
8.17.12	IOR Setting	1.300000 to 1.699999 (0.000001 steps)	
8.17.13	Units	km, m, kft, ft, mi	
8.17.14	Languages	User selectable (English a must)	
8.17.15	Sampling Points*2	Normal: 5001, High density: 20001 or 25001, Very high density: 100,001 or 150,001	
8.17.16	Sampling Resolution	0.05m to 60m	
8.17.17	Reflectance Accuracy	Single mode: ±2 dB, multimode: ±4 dB	
	Distance Accuracy	14- 15- ±1 m ±3 × measurement distance × 10–5 ± marker resolution (excluding IOR uncertainty)	
8.17.18	Distance Range	Single mode: 0.5 to 300 km Multimode: 0.5 to 100 km	
8.17.19	Testing Modes	1-Fibre Visualizer: Provides end/break location, end to end loss, fibre length, easy graphical summary, PDF report, PDF viewer 2-Standard OTDR: User selectable automatic or manual set-up 3-Construction OTDR: Automated, multi-wavelength testing 4-Light source: Stabilized Light source (CW, 270 Hz, 1 kHz, 2 kHz output) 5-Loss test set: Power meter and Light source 6- Connector Video Inspection Probe 7-Visual fault locator (optional): Visible red light for fibre identification and troubleshooting	
8.17.20	Fibre Event Analysis	A- Auto or manual operation, displayed in table format B- User defined PASS/FAIL thresholds: - Reflective and non-reflective events: 0.01 to 9.99 dB (0.01 dB steps) - Reflectance: –70.0 to –20.0 dB (0.1 dB steps) - Fibre end/break: 1 to 99 dB (1 dB steps) C- Number of detected events: up to 99 D -Macro bend detection	
8.17.21	OTDR Trace Format	Telcordia universal. SOR, issue 2 (SR-4731)	
8.17.22	Other Functions		
8.17.22.1	Real time sweep*3	0.15 sec	
8.17.22.2	Loss modes	2-point loss, dB/km, 2-point LSA, splice loss, ORL	
8.17.22.3	Averaging modes	Timed (1 to 3600 sec.)	
8.17.22.4	Live fibre detect	Verifies presence of communication light in optical Fibre	
8.17.22.5	Connection check	Automatic check of OTDR to FUT connection quality	
8.17.22.6	Connectivity	Bluetooth, Wi-Fi and Ethernet	
8.17.22.7	Environmental Conditions		
8.17.22.8	Operating temperature and humidity	–10° to +50°C, <80% (non-condensing)	
8.17.22.9	Storage temperature and humidity	–20° to +60°C, <80% (non-condensing)	
8.17.22.10	Vibration	Conforming to MIL-T-28800E Class 3	

8.17.22.11	Dust proof	MIL-T-28800E (Dust Exposure) Class 2	
	Drip proof	IP51 (IEC 60529), JIS C 0920 TYPE I	
8.17.22.12	CE	EMC: EN61326-1, EN61000-3-2 LVD: EN61010-1 RoHS: EN50581	

PART 3 - Conditions of Contract and Contract Forms

Section VIII – General Conditions of Contract

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General Conditions of Contract

A. Contract and Interpretation

- 1. Definitions**
- 1.1 The following words and expressions shall have the meanings hereby assigned to them:
- “Contract”** means the Contract Agreement entered into between the Employer and the Contractor, together with the Contract Documents referred to therein; 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.
- “PCC”** means the Particular Conditions of Contract.
- “day”** means calendar day.
- “year”** means 365 days.
- “month”** means calendar month.
- “Party”** means the Employer or the Contractor, as the context requires, and “Parties” means both of them.
- “Employer”** means the person **named as such in the PCC** and includes the legal successors or permitted assigns of the Employer.
- “Project Manager”** means the person appointed by the Employer in the manner provided in GCC Sub-Clause 17.1 (Project Manager) hereof and **named as such in the PCC** to perform the duties delegated by the Employer.
- “Contractor”** means the person(s) whose Bid to perform the Contract has been accepted by the Employer 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 Employer in the manner provided in GCC Sub-Clause 17.2 (Contractor’s Representative and Construction Manager) hereof 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 PCC appointed by agreement between the Employer and the Contractor to make a decision with respect to any dispute or difference between the Employer and the Contractor referred to him or her by the Parties pursuant to GCC Sub-Clause 46.1 (Dispute Board) hereof.
- “The Bank”** means the financing institution **named in the PCC**.
- “Contract Price”** means the sum specified in Article 2.1 (Contract Price) of the Contract Agreement, subject to such additions and adjustments thereto or deductions therefrom, 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-Clause 7.3 hereof), 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, precommissioning, 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 under the rules of the Bank as further **elaborated in the PCC**.

“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 Clause 8 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 Precommissioning 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.

“Precommissioning” means the testing, checking and other requirements specified in the Employer’s Requirements that are to be carried out by the Contractor in preparation for Commissioning as provided in GCC Clause 24 (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 Employer’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-Clause 25.2 (Guarantee Test) hereof.

“Operational Acceptance” means the acceptance by the Employer 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 fulfillment 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.

“ES” means Environmental and Social (including Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH)).

“Sexual Exploitation and Abuse” “(SEA)” means the following:

Sexual Exploitation is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another.

Sexual Abuse is defined as the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;

“Sexual Harassment” “(SH)” is defined as unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature by the Contractor’s Personnel with other Contractor’s Personnel or Employer’s Personnel.

“Contractor’s Personnel” means all personnel whom the Contractor utilizes in the execution of the Contract, including the staff, labor and other employees of the Contractor and each Subcontractor; and any other personnel assisting the Contractor in the execution of the Contract; and

“Employer’s Personnel” means all staff, labor and other employees of the Project Manager and of the Employer engaged in fulfilling the Employer’s obligations under the Contract; and any other personnel identified as Employer’s Personnel, by a notice from the Employer to the Contractor.

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 “Bid,” “tenderer,” with “Bidder,” and “tender documents” with “Bidding 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 into consideration in the interpretation of these Conditions. 3.2 <u>Incoterms</u> 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 <i>Incoterms</i>. Incoterms means international rules for interpreting trade terms published by the International Chamber of Commerce (latest edition), 38 Cours Albert 1^{er}, 75008 Paris, France. 3.3 <u>Entire Agreement</u> Subject to GCC Sub-Clause 16.4 hereof, the Contract constitutes the entire agreement between the Employer 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 thereto made prior to the date of Contract. 3.4 <u>Amendment</u> 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 <u>Independent Contractor</u> The Contractor shall be an independent contractor 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 Employer, and nothing contained in the Contract or in any subcontract awarded by the Contractor shall be construed to create any contractual relationship between any such employees, representatives or Subcontractors and the Employer. 3.6 <u>Non-Waiver</u> 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, invalidity or unenforceability shall not affect the validity or enforceability 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 different in its basic characteristics or in purpose or utility from its components.

4. Communications

4.1 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

5.1 The Contract shall be governed by and interpreted in accordance with laws of the country **specified in the PCC**.

5.2 The ruling language of the Contract shall be that **stated in the PCC**.

5.3 The language for communications shall be the ruling language unless otherwise **stated in the PCC**.

6. Fraud and Corruption

6.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as set forth in Appendix B to the GCC.

6.2 The Employer requires the Contractor to disclose any commissions or fees that may have been paid or are to be paid to agents or any other party with respect to the Bidding process or execution of the Contract. The information disclosed must include at least the name and address of the agent or other party, the amount and currency, and the purpose of the commission, gratuity or fee.

B. Subject Matter of Contract

7. Scope of Facilities

7.1 Unless otherwise expressly limited in the Employer'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, Precommissioning 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, Employer'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 Employer, as set forth in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer.

- 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 PCC** and the provisions, if any, **specified in the PCC**. However, the identity, specifications and quantities of such spare parts and the terms and conditions relating to the supply thereof are to be agreed between the Employer 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 therefor and other costs and expenses (including the Contractor's fees) relating to the supply of spare parts.
- 8. Time for Commencement and Completion**
- 8.1 The Contractor shall commence work on the Facilities within the period **specified in the PCC** and without prejudice to GCC Sub-Clauses 9.9 and 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 PCC** or within such extended time to which the Contractor shall be entitled under GCC Clause 40 hereof.
- 9. Contractor's Responsibilities**
- 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 into 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 Employer, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site if access thereto was available and of other data readily available to it relating to the Facilities as of the date twenty-eight (28) days prior to Bid 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 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 Employer under GCC Sub-Clause 10.3 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 Employer 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 Clause 1 (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 Employer for the fulfillment 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 Employer.

- 9.7 Pursuant to paragraph 2.2 e. of Appendix B to the General Conditions the Contractor shall permit and shall cause its agents (where declared or not), subcontractors, subconsultants, service providers, suppliers, and personnel, to permit, the Bank and/or persons appointed by the Bank to inspect the site and/or the accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have such accounts, records and other documents audited by auditors appointed by the Bank. The Contractor's and its Subcontractors' and subconsultants' attention is drawn to Sub-Clause 6.1 (Fraud and Corruption) which provides, inter alia, that acts intended to materially impede the exercise of the Bank's inspection and audit rights constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Bank's prevailing sanctions procedures).

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

- 9.9 Contractor's Environmental and Social Management Plan (C-ESMP)

The Contractor shall not carry out mobilization to Site unless the Project Manager gives approval, an approval that shall not be unreasonably delayed, to the measures the Contractor proposes to address environmental and social risks and impacts including the code of conduct, in accordance with GCC Sub-Clause 22.4.

The Contractor shall submit, to the Project Manager for Review, any additional Management Strategies and Implementation Plans as are necessary to manage the ES risks and impacts of the Facilities. These Management Strategies and Implementation Plans collectively comprise the Contractor's Environmental and Social Management Plan (C-ESMP).

The Contractor shall review the C-ESMP, periodically (but not less than every six (6) months), and update it as required to ensure that it contains measures appropriate to the Facilities. The updated C-ESMP shall be submitted to the Project Manager for its approval.

- 9.10 Training of Contractor's Personnel

The Contractor shall provide appropriate training to relevant Contractor's Personnel on ES aspects of the Contract, including appropriate sensitization on prohibition of SEA and health and safety training referred to in GCC Sub-Clause 22.2.7.

As stated in the Employer's Requirements or as instructed by the Project Manager, the Contractor shall also allow appropriate opportunities for the relevant Contractor's Personnel to be trained on ES aspects of the Contract by the Employer's personnel and/or other personnel assigned by the Employer.

- 9.11 Stakeholder engagements

The Contractor shall provide relevant contract-related information, as the Employer and/or Project Manager may reasonably request to conduct contract stakeholder engagement. "Stakeholder" refers to individuals or groups who:

- (a) are affected or likely to be affected by the Contract; and
- (b) may have an interest in the Contract.

The Contractor may also directly participate in contract stakeholder engagements, as the Employer and/or Project Manager may reasonably request.

- 9.12 Forced Labor

The Contractor, including its Subcontractors, shall not employ or engage forced labour. Forced labour consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements.

No persons shall be employed or engaged who have been subject to trafficking. Trafficking in persons is defined as the recruitment, transportation, transfer, harbouring or receipt of persons by means of the threat or use of force or other forms of coercion, abduction, fraud,

deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purposes of exploitation.

The Contractor shall also take measures to require its suppliers (other than Subcontractors) not to employ or engage forced labour including trafficked persons. If forced labour/trafficking cases are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

9.13 Child Labor

The Contractor, including its Subcontractors, shall not employ or engage a child under the age of 14 unless the national law specifies a higher age (the minimum age).

The Contractor, including its Subcontractors, shall not employ or engage a child between the minimum age and the age of 18 in a manner that is likely to be hazardous, 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.

The Contractor including its Subcontractors, shall only employ or engage children between the minimum age and the age of 18 after an appropriate risk assessment has been conducted by the Contractor with the Engineer's consent. The Contractor shall be subject to regular monitoring by the Project Manager that includes monitoring of health, working conditions and hours of work.

Work considered hazardous for children is work that, by its nature or the circumstances in which it is carried out, is likely to jeopardize the health, safety, or morals of children. Such work activities prohibited for children include work:

- (a) with exposure to physical, psychological or sexual abuse;
- (b) underground, underwater, working at heights or in confined spaces;
- (c) with dangerous machinery, equipment or tools, or involving handling or transport of heavy loads;
- (d) in unhealthy environments exposing children to hazardous substances, agents, or processes, or to temperatures, noise or vibration damaging to health; or
- (e) under difficult conditions such as work for long hours, during the night or in confinement on the premises of the employer.

The Contractor shall also take measures to require its suppliers (other than Subcontractors) not to employ or engage child labor. If child labor cases are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

9.14 Serious Safety Issues

The Contractor, including its Subcontractors, shall comply with all applicable safety obligations. The Contractor shall also take measures to require its suppliers (other than Subcontractors) to adopt procedures and mitigation measures adequate to address safety issues related to their personnel. If serious safety issues are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

9.15 Obtaining natural resource materials

The Contractor shall obtain natural resource materials from suppliers that can demonstrate, through compliance with the applicable verification and/ or certification requirements, that obtaining such materials is not contributing to the risk of significant conversion or significant degradation of natural or critical habitats such as unsustainably harvested wood products, gravel or sand extraction from riverbeds or beaches.

If a supplier cannot continue to demonstrate that obtaining such materials is not contributing to the risk of significant conversion or significant degradation of natural or critical habitats, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to

demonstrate that they are not significantly adversely impacting the habitats.

9.16 Site Signage

The Contractor shall not post and shall ensure that its Subcontractors/suppliers/manufacturers and Contractors' Personnel shall not post, any signage on the Site, or in any other place where the Works will be carried out, except such signage as is required under the Contract, including by the Laws of the Country, or has been approved by the Employer. For the purposes of this sub-clause, signage shall include, inter alia, flags, billboards, advertising materials and any other similar item separately posted on the Site.

10. Employer's Responsibilities

- 10.1 All information and/or data to be supplied by the Employer as described in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, shall be deemed to be accurate, except when the Employer expressly states otherwise.
- 10.2 The Employer 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 Employer. The Employer shall give full possession of and accord all rights of access thereto on or before the date(s) specified in that Appendix.
- 10.3 The Employer 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 (a) such authorities or undertakings require the Employer to obtain in the Employer's name, (b) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract, and (c) are specified in the Appendix (Scope of Works and Supply by the Employer).
- 10.4 If requested by the Contractor, the Employer shall use its best endeavors 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 undertakings 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 Employer and the Contractor, the Employer 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 Precommissioning, 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 Employer, at or before the time specified in the program furnished by the Contractor under GCC Sub-Clause 18.2 hereof and in the manner thereupon specified or as otherwise agreed upon by the Employer and the Contractor.
- 10.6 The Employer 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 Employer, save those to be incurred by the Contractor with respect to the performance of Guarantee Tests, in accordance with GCC Sub-Clause 25.2.
- 10.8 In the event that the Employer shall be in breach of any of his obligations under this Clause, the additional cost incurred by the Contractor in consequence thereof shall be determined by the Project Manager and added to the Contract Price.

C. Payment

- 11. Contract Price**
- 11.1 The Contract Price shall be 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 PCC**, 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**
- 12.1 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 Employer herein shall be deemed to constitute acceptance by the Employer of the Facilities or any part(s) thereof.
- 12.3 In the event that the Employer fails to make any payment by its respective due date or within the period set forth in the Contract, the Employer 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 Bid.
- 12.5 **As specified in the PCC**, if the Contractor fails to perform its cyber security obligations under the Contract, an assessed amount, as determined by the Project Manager, may be withheld until the obligation has been performed.
- 13. Securities**
- 13.1 Issuance of Securities
- The Contractor shall provide the securities specified below in favor of the Employer 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 Bidding documents or in another form acceptable to the Employer. 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 Employer. 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 PCC**.
- 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 Employer, and shall be in the form provided in Section X, Contract Forms, corresponding to the type of bank guarantee stipulated by the Employer in the PCC, or in another form acceptable to the Employer.
- 13.3.3 Unless otherwise specified in the PCC, 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 pro rata 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-Clause 27.8 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 PCC pursuant to GCC Sub-Clause 27.10 and up to the amount specified in the PCC.

13.3.4 The Employer shall not make a claim under the Performance Security, except for amounts to which the Employer is entitled under the Contract. The Employer 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 Employer was not entitled to make the claim.

- 14. Taxes and Duties**
- 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 Notwithstanding GCC Sub-Clause 14.1 above, the Employer shall bear and promptly pay
- (a) all customs and import duties for the Plant specified in Price Schedule No. 1; and
 - (b) other domestic taxes such as, sales tax and value added tax (VAT) on the Plant specified in Price Schedules No. 1 and No. 2 and that is to be incorporated into the Facilities, and on the finished goods, imposed by the law of the country where the Site is located.
- 14.3 If any tax exemptions, reductions, allowances or privileges may be available to the Contractor in the country where the Site is located, the Employer shall use its best endeavors to enable the Contractor to benefit from any such tax savings to the maximum allowable extent.
- 14.4 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 Bid submission in the country where the Site is located (hereinafter called "Tax" in this GCC Sub-Clause 14.4). 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 into account any such change by addition to the Contract Price or deduction therefrom, as the case may be, in accordance with GCC Clause 36 hereof.

D. Intellectual Property

- 15. License/Use of Technical Information**
- 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 Employer 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 thereunder, and shall also grant to the Employer 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 Employer 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 Employer.
- 15.2 The copyright in all drawings, documents and other materials containing data and information furnished to the Employer by the Contractor herein

shall remain vested in the Contractor or, if they are furnished to the Employer directly or through the Contractor by any third Party, including suppliers of materials, the copyright in such materials shall remain vested in such third Party.

16. Confidential Information

- 16.1 The Employer 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 Employer 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 undertaking of confidentiality similar to that imposed on the Contractor under this GCC Clause 16.
- 16.2 The Employer 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 Employer 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 hereafter 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
 - (d) is being provided to the Bank.
- 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.

E. Execution of the Facilities

17. Representatives

17.1 Project Manager

If the Project Manager is not named in the Contract, then within fourteen (14) days of the Effective Date, the Employer shall appoint and notify the Contractor in writing of the name of the Project Manager. The Employer 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 Employer 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 herein otherwise provided.

All notices, instructions, information and other communications given by the Contractor to the Employer 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 Employer in writing to approve the person so appointed. If the Employer makes no objection to the

appointment within fourteen (14) days, the Contractor's Representative shall be deemed to have been approved. If the Employer 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-Clause 17.2.1 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.

All notices, instructions, information and all other communications given by the Employer 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.

The Contractor shall not revoke the appointment of the Contractor's Representative without the Employer's prior written consent, which shall not be unreasonably withheld. If the Employer 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.

- 17.2.3 The Contractor's Representative may, subject to the approval of the Employer 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 thereby delegated or revoked. No such delegation or revocation shall take effect unless and until a copy thereof has been delivered to the Employer and the Project Manager.

Any act or 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 act or exercise by the Contractor's Representative.

- 17.2.4 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.

- 17.2.5 The Project Manager may require the Contractor to remove (or cause to be removed) the Contractor's Representative or any other person employed by the Contractor in the execution of the Contract, who:

- (a) persists in any misconduct or lack of care;
- (b) carries out duties incompetently or negligently;
- (c) fails to comply with any provision of the Contract;
- (d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment;
- (e) based on reasonable evidence, is determined to have engaged in Fraud and Corruption during the execution of the Contract;
- (f) has been recruited from the Employer's Personnel in breach of GCC Sub-Clause 22.2.2;
- (g) undertakes behaviour which breaches the Code of Conduct (ES), as applicable;

If appropriate, the Contractor shall then promptly appoint (or cause to be appointed) a suitable replacement with equivalent skills and experience.

Notwithstanding any requirement from the Project Manager to remove or cause to remove any person, the Contractor shall take immediate action as appropriate in response to any violation of (a) through (g) above. Such immediate action shall include removing (or causing to be removed) from the Site or other places where the Contract is being executed, any Contractor's Personnel who engages in (a), (b), (c), (d), (e) or (g) above or has been recruited as stated in (f) above..

- 17.2.6 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 suitable replacement with equivalent skills and experience.

18. Work Program

18.1 Contractor's Organization

The Contractor shall supply to the Employer 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 Employer 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 precommission the Facilities, as well as the date by which the Contractor reasonably requires that the Employer 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 PCC 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.

Unless otherwise stated in the Employer's Requirements, each progress report shall include the Environmental and Social (ES) metrics set out in Appendix C.

If stated in the PCC, progress report shall include status of compliance to cyber security risks management, and any foreseeable cyber security risk and mitigation.

In addition to the progress reports, the Contractor shall inform the Project Manager immediately of any allegation, incident or accident in the Site, which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel or Contractor's Personnel. This includes, but is not limited to, any incident or accident causing fatality or serious injury; significant

adverse effects or damage to private property; any cyber security incidents **as specified in the PCC**; or any allegation of SEA and/or SH. In case of SEA and/or SH, while maintaining confidentiality as appropriate, the type of allegation (sexual exploitation, sexual abuse or sexual harassment), gender and age of the person who experienced the alleged incident should be included in the information.

The Contractor, upon becoming aware of the allegation, incident or accident, shall also immediately inform the Project Manager of any such incident or accident on the Subcontractors' or suppliers' premises relating to the Facilities which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel, or Contractor's, its Subcontractors' and suppliers' personnel. The notification shall provide sufficient detail regarding such incidents or accidents. The Contractor shall provide full details of such incidents or accidents to the Project Manager within the timeframe agreed with the Project Manager.

The Contractor shall require its Subcontractors and suppliers to immediately notify the Contractor of any incidents or accidents referred to in this Subclause.

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 will so fall behind, the Contractor shall, at the request of the Employer 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 Employer 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 Employer'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. Insofar 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 Employer for its approval in sufficient time so as not to impede the progress of work on the Facilities. Submission by the Contractor, for addition of any Subcontractor not named in the Contract, shall also include the Subcontractor's declaration in accordance with Appendix D- Sexual exploitation and Abuse (SEA) and/or Sexual Harassment (SH) Performance Declaration. Approval by the Employer 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-Clause 19.1.
- 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 Employer to require the sub-contract to be assigned to the Employer

under GCC 19.5 (if and when applicable), or in event of termination by the Employer 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 Employer, then the Contractor shall do so.
- 19.6 The Contractor shall ensure that its Subcontractors execute the Facilities in accordance with the Contract, including complying with the relevant ES requirements and the obligations set out in GCC Sub-Clause 22.4.

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.

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 Employer.

- 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 Employer, 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 Bid submission shall apply unless otherwise specified. During Contract execution, any changes in such codes and standards shall be applied subject to approval by the Employer 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).

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.

- 20.3.2 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 thereon 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.

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

- 20.3.4 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), whereupon the document shall be deemed to have been approved.

- 20.3.5 If any dispute or difference occurs between the Employer and the Contractor in connection with or arising out of the disapproval by the Project Manager of any document and/or any modification(s) thereto 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 Employer has not given notice under GCC Sub-Clause 46.3 hereof, then the Contractor shall be reimbursed by the Employer 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.
- 20.3.6 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.
- 20.3.7 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 thereon, 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 Employer-Supplied Plant

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

- 21.2.1 The Employer 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-Clause 18.2, 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 Employer shall immediately remedy any shortage, defect or default, or the Contractor shall, if practicable and possible, at the request of the Employer, remedy such shortage, defect or default at the Employer'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-Clause 21.2.2 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 Employer 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 Employer 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 country where the Site is located, if applicable, and at the Site. The Contractor shall furnish the Employer 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 Employer shall use its best endeavors 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 Employer 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

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 Employer'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 Employer, the Employer 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 Clause 40.

22. **Installation**

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 Employer.

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 forthwith 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 Employer, the expense of rectifying the same shall be borne by the Employer.

- 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 superintendence 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 **Labor:**

22.2.1 **Engagement of Staff and Labor**

Except as otherwise stated in the Employer's Requirements, the Contractor shall make arrangements for the engagement of all staff and labor, 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 labor as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged to use local labor 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 labor and personnel to be employed on the Site into the country where the Site is located. The Employer will, if requested by the Contractor, use his best endeavors 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 Contractor's Personnel employed for the execution of the Contract at the Site or other places where the Installation Services are carried out 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 Employer may provide the same to such personnel and recover the cost of doing so from the Contractor.

The Contractor shall provide Contractor's Personnel employed for the execution of the Contract at the Site or other places where the Installation Services are carried out, relevant information and documentation that are clear and understandable regarding their terms and conditions of employment. The information and documentation shall set out their rights under relevant labor laws applicable to the Contractor's Personnel (which will include any applicable collective agreements), including their rights related to hours of work, wages, overtime, compensation and benefits, as well as those arising from any requirements in the Employer's Requirements. The Contractor's Personnel shall be informed when any material changes to their terms or conditions of employment occur.

22.2.2 Persons in the Service of Employer

The Contractor shall not recruit, or attempt to recruit, staff and labor from amongst the Employer's Personnel.

22.2.3 Labor Laws

The Contractor shall comply with all the relevant labor 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 endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst its employees and the labor of its Subcontractors.

The Contractor shall, in all dealings with its labor and the labor 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 labor.

22.2.4 Rates of Wages and Conditions of Labor

The Contractor shall pay rates of wages, and observe conditions of labor, 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 employers whose trade or industry is similar to that of the Contractor.

The Contractor shall inform the Contractor's Personnel about:

- (a) any deduction to their payment and the conditions of such deductions in accordance with the applicable laws or as stated in the Employer's Requirements; and
- (b) their liability to pay personal income taxes in the Country in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the laws of the Country for the time being in force.

The Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws.

Where required by applicable Laws or as stated in the Employer's Requirements, the Contractor and its Subcontractors shall provide their personnel written notice of termination of employment and details of severance payments in a timely manner. The Contractor and its Subcontractors shall have paid their personnel (either directly or where appropriate for their benefit) all due wages and entitlements including, as applicable, social security benefits and pension contributions, on or before the end of their engagement/ employment.

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 PCC, 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 Facilities, in which case the Contractor shall immediately advise the Project Manager.

If and when the Contractor considers it necessary to carry out 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 Labor

Except as otherwise stated in the Employer's Requirements, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel employed for the execution of the Contract at the Site or other places where the Installation Services are carried out. The Contractor shall also provide facilities for the Employer's Personnel as stated in the Employer's Requirements.

If stated in the Employer's Requirements, the Contractor shall give access to or provide services that accommodate the physical, social and cultural needs of the Contractor's Personnel. The Contractor shall also provide similar facilities for the Employer's Personnel as stated in the Employer's Requirements.

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 Facilities.

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 employed for the execution of Installation Services at the Site (or other places in the country where the Site is located).

Subject to GCC Sub-Clause 9.9, the Contractor shall submit to the Project Manager for its approval a health and safety

manual which sets out all the health and safety requirements under the Contract.

The health and safety manual shall be in addition to any other similar document required under applicable health and safety regulations and Laws.

The Contractor shall:

- (a) comply with all applicable health and safety regulations and laws;
- (b) comply with all applicable health and safety obligations specified in the Contract;
- (c) develop and implement procedures to establish and maintain a safe working environment without risk to health at all workplaces, machinery, equipment and processes under the control of the Contractor, including control measures for chemical, physical and biological substances and agents;
- (d) provide health and safety training of the Contractor's Personnel as appropriate and maintain training records;
- (e) actively engage the Contractor's Personnel in promoting understanding, and methods for, implementation of health and safety requirements, as well as in providing information to such personnel, and provision of personal protective equipment without expense to the personnel;
- (f) put in place workplace processes for the Contractor's Personnel to report work situations that they believe are not safe or healthy, and to remove themselves from a work situation which they have reasonable justification to believe presents an imminent and serious danger to their life or health; Contractor's Personnel who remove themselves from such work situations shall not be required to return to work until necessary remedial action to correct the situation has been taken. Such personnel shall not be retaliated against or otherwise subject to reprisal or negative action for such reporting or removal;
- (g) in collaboration with local health authorities, 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 Employer's Personnel;
- (h) 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;
- (i) put in place measures to avoid or minimize the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases;
- (j) put in place measures to be implemented to avoid or minimize the spread of communicable diseases (including transfer of Sexually Transmitted Diseases or Infections (STDs), such as HIV virus) and non-communicable diseases associated with the Installation Services, taking into consideration differentiated exposure to and higher sensitivity of vulnerable groups. This includes taking measures to avoid or minimize the transmission of communicable diseases that may be associated with the influx of temporary or permanent Contract-related labor;
- (k) have in place procedures for prevention, preparedness and response activities to be implemented in the case of an emergency event (i.e. an unanticipated incident, arising from both natural and man-made hazards,

typically in the form of fire, explosions, leaks or spills, which may occur for a variety of different reasons including failure to implement operating procedures that are designed to prevent their occurrence, extreme weather or lack of early warning);

- (l) collaborate, as applicable, with the Employer's Personnel, any other contractors employed by the Employer, and/or personnel of any legally constituted public authorities and private utility companies that are employed in carrying out, on or near the site, of any work not included in the Contract, in applying the health and safety requirements. This is without prejudice to the responsibility of the relevant entities for the health and safety of their own personnel; and
- (m) put in place a system for regular review of health and safety performance and the working environment.

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 PCC.

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 Foodstuffs

The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Employer's Requirements 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 the Country, 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 Workers' Organizations

In countries where the relevant labor laws recognize workers' rights to form and to join workers' organizations of their choosing and to bargain collectively without interference, the Contractor shall comply with such laws. In such circumstances, the role of legally established workers' organizations and legitimate workers' representatives will be

respected, and they will be provided with information needed for meaningful negotiation in a timely manner. Where the relevant labor laws substantially restrict workers' organizations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working conditions and terms of employment. The Contractor shall not seek to influence or control these alternative means. The Contractor shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and collective bargaining or alternative mechanisms. Workers' organizations are expected to fairly represent the workers in the workforce.

22.2.16 Non-Discrimination and Equal Opportunity

The Contractor shall not make decisions relating to the employment or treatment of Contractor's Personnel on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment of Contractor's Personnel on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices.

Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination. The Contractor shall provide protection and assistance as necessary to ensure non-discrimination and equal opportunity, including for specific groups such as women, people with disabilities, migrant workers and children (of working age in accordance with GCC Sub-Clause 9.13).

22.2.17 Contractor's Personnel Grievance Mechanism

The Contractor shall have a grievance mechanism for the Contractor's Personnel, and where relevant the workers' organizations stated in subclause 22.2.15, to raise workplace concerns. The grievance mechanism shall be proportionate to the nature, scale, risks and impacts of the Contract. The mechanism shall address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned in a language they understand, without any retribution, and shall operate in an independent and objective manner.

The Contractor's Personnel shall be informed of the grievance mechanism at the time of engagement for the Contract, and the measures put in place to protect them against any reprisal for its use. Measures will be put in place to make the grievance mechanism easily accessible to all Contractor's Personnel.

The grievance mechanism shall not impede access to other judicial or administrative remedies that might be available, or substitute for grievance mechanisms provided through collective agreements.

The grievance mechanism may utilize existing grievance mechanisms, providing that they are properly designed and implemented, address concerns promptly, and are readily accessible to such project workers. Existing grievance mechanisms may be supplemented as needed with Contract-specific arrangements.

22.3 Contractor's Equipment

22.3.1 All Contractor's Equipment brought by the Contractor onto 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 onto the Site and any surplus materials remaining thereon.

22.3.3 The Employer will, if requested, use its best endeavors 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

The Employer 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 therewith. The Contractor shall prepare and submit to the Project Manager with a copy to the Employer, proposed Site regulations for the Project Manager's approval, which approval shall not be unreasonably withheld.

Such Site regulations shall include, but shall not be limited to, Code of Conduct for environmental and social aspects submitted as part of the Bid and agreed to by the Employer, , security arrangements in accordance with GCC Sub-Clause 22.8, safety of the Facilities, gate control, sanitation, medical care, and fire prevention.

The Contractor shall take all necessary measures to ensure that each Contractor's Personnel, employed for the execution of the Contract at the Site or other places where the Installation Services are carried out, is made aware of the Code of Conduct including specific behaviors that are prohibited, and understands the consequences of engaging in such prohibited behaviors.

These measures include providing instructions and documentation that can be understood by the Contractor's Personnel and seeking to obtain that person's signature acknowledging receipt of such instructions and/or documentation, as appropriate.

The Contractor shall also ensure that the Code of Conduct is visibly displayed in multiple locations on the Site and any other place where the Installation Services will be carried out, as well as in areas outside the Site accessible to the local community and project affected people. The posted Code of Conduct shall be provided in languages comprehensible to Contractor's Personnel, Employer's Personnel and the local community.

The Contractor's Management Strategy and Implementation Plans shall include appropriate processes for the Contractor to verify compliance with these obligations.

22.5 Opportunities for Other Contractors

22.5.1 The Contractor shall, upon written request from the Employer or the Project Manager, give all reasonable opportunities for carrying out the work to any other contractors employed by the Employer on or near the Site.

22.5.2 If the Contractor, upon written request from the Employer 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 Employer 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 Employer 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 Employer may do or cause such work to be done as the Employer may determine is necessary in order to prevent damage to the Facilities. In such event the Employer 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 therefor. If the work done or caused to be done by the Employer is work that the Contractor was liable to do at its own expense under the Contract, the reasonable costs incurred by the Employer in connection therewith shall be paid by the Contractor to the Employer. Otherwise, the cost of such remedial work shall be borne by the Employer.

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 Security of the Site

The Contractor shall be responsible for the security of the Site including providing and maintaining 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.

If required in the Employer's Requirements, the Contractor shall submit for the Project Manager's No-objection a security management plan that sets the security arrangements for the Site.

In making security arrangements, the Contractor shall be guided by applicable laws and any other requirements stated in the Employer's Requirements.

The Contractor shall (i) conduct appropriate background checks on any personnel retained to provide security; (ii) train the security personnel adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms), and appropriate conduct towards Contractor's Personnel, Employer's personnel and affected communities; and (iii) require the security personnel to act within the applicable Laws and any requirements set out in the Employer's Requirements.

The Contractor shall not permit any use of force by security personnel in providing security except when used for preventive and defensive purposes in proportion to the nature and extent of the threat.

22.9 Protection of the Environment

The Contractor shall take all necessary measures to:

- i. protect the environment (both on and off the Site); and
- ii. limit damage and nuisance to people and property resulting from pollution, noise and other results of the Contractor's operations and/or activities.

The Contractor shall ensure that emissions, surface discharges, effluent and any other pollutants from the Contractor's activities shall exceed neither the values indicated in the Employer's Requirements, nor those prescribed by applicable laws.

In the event of damage to the environment, property and/or nuisance to people, on or off Site as a result of the Contractor's operations, the Contractor shall agree with the Project Manager the appropriate actions and time scale to remedy, as practicable, the damaged environment to its former condition. The Contractor shall implement such remedies at its cost to the satisfaction of the Project Manager.

22.10 Traffic and Road Safety

The Contractor shall take all necessary safety measures to avoid the occurrence of incidents and injuries to any third party associated with the use of Contractor's Equipment on public roads or other public infrastructure.

The Contractor shall monitor and use road safety incidents and accidents reports to identify negative safety issues, and establish and implement necessary measures to resolve them.

22.11 Cultural Heritage Findings

All fossils, coins, articles of value or antiquity, structures, groups of structures, and other remains or items of geological, archaeological, paleontological, historical, architectural, religious interest found on the Site shall be placed under the care and custody of the Employer.

The Contractor shall:

- (a) take all reasonable precautions, including fencing-off the area or site of the finding, to avoid further disturbance and prevent Contractor's Personnel or other persons from removing or damaging any of these findings;
- (b) as soon as practicable after discovery of any such finding, give a notice to the Project Manager, to give the Project Manager the opportunity to promptly inspect and/or investigate the finding before it is disturbed and to issue instructions for dealing with it;
- (c) train relevant Contractor's Personnel on the procedures for handling such findings; and
- (d) implement any other action consistent with the requirements of the Employer's Requirements and relevant laws.

If the Contractor suffers delay and/or incurs extra costs from complying with the Project Manager instructions, the Contractor shall be entitled to an extension of time under GCC Sub-Clause 40.1, and the amount of such extra costs shall be added to the Contract Price.

23. Test and Inspection

23.1 The Contractor shall at its own expense carry out 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 Employer and the Project Manager or their designated representatives shall be entitled to attend the aforesaid test and/or inspection, provided that the Employer 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. The Contractor shall obtain from any relevant third Party or manufacturer any necessary permission or consent to enable the Employer 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 Employer 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 an Dispute Board for determination in accordance with GCC Sub-Clause 46.3.
- 23.8 The Contractor shall afford the Employer and the Project Manager, at the Employer'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. Without prejudice to GCC Sub-Clause 9.7, as instructed by the Project Manager, the Contractor shall also afford other relevant entities (at the Employer's or their respective entities' expense, as appropriate) access to the Facilities, to inspect progress and the manner of the execution of the Facilities, carry out environmental and social audit, as appropriate, or carry out any other duty as stated in the Employer's Requirements or as instructed by the Project Manager.
- 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 Employer 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 up on 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 thereof 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 Employer, 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

- 24.1 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 Employer's Requirements, excluding minor items not materially affecting the operation or safety of the Facilities, the Contractor shall so notify the Employer in writing.
- 24.2 Within seven (7) days after receipt of the notice from the Contractor under GCC Sub-Clause 24.1, the Employer shall supply the operating and maintenance personnel specified in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer for Precommissioning of the Facilities or any part thereof.

Pursuant to the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, the Employer shall also provide, within the said seven (7) day period, the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Precommissioning of the Facilities or any part thereof.

24.3 As soon as reasonably practicable after the operating and maintenance personnel have been supplied by the Employer and the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters have been provided by the Employer in accordance with GCC Sub-Clause 24.2, the Contractor shall commence Precommissioning of the Facilities or the relevant part thereof in preparation for Commissioning, subject to GCC Sub-Clause 25.5.

24.4 As soon as all works in respect of Precommissioning 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.

24.5 The Project Manager shall, within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 24.4, either issue a Completion Certificate in the form specified in the Employer'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.

24.6 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 Employer makes use of the Facilities or part thereof, then the Facilities or that part thereof shall be deemed to have reached Completion as of the date of the Contractor's notice or repeated notice, or as of the Employer's use of the Facilities, as the case may be.

24.7 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 Employer will undertake such completion and deduct the costs thereof from any monies owing to the Contractor.

24.8 Upon Completion, the Employer 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 thereof shall be commenced by the Contractor immediately after issue of the Completion Certificate by the Project Manager, pursuant to GCC Sub-Clause 24.5, or immediately after the date of the deemed Completion, under GCC Sub-Clause 24.6.
- 25.1.2 The Employer 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 Employer.

25.2 Guarantee Test

- 25.2.1 Subject to GCC Sub-Clause 25.5, the Guarantee Test and repeats thereof 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 Employer 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.
- 25.2.2 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 PCC** or any other period agreed upon by the Employer 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 PCC pursuant to GCC Sub-Clause 25.2.2 above or any other period agreed upon by the Employer and the Contractor; or
 - (c) the Contractor has paid the liquidated damages specified in GCC Sub-Clause 28.3 hereof; and
 - (d) any minor items mentioned in GCC Sub-Clause 24.7 hereof 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 Employer's Requirements (Forms and Procedures) in respect of the Facilities or the part thereof specified in such notice as of the date of such notice.
- 25.3.3 The Project Manager shall, after consultation with the Employer, 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 thereof 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 thereafter complete any outstanding minor items that are listed in the Operational Acceptance Certificate.

25.5 Delayed Precommissioning and/or Guarantee Test

25.5.1 In the event that the Contractor is unable to proceed with the Precommissioning 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 Employer 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 Employer, 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 Employer;
- (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 Employer 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.

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 Employer 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 Precommissioning, the Contractor shall proceed without delay in performing Precommissioning in accordance with Clause 24.

F. Guarantees and Liabilities

- 26. Completion Time Guarantee**
- 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 PCC 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 Employer liquidated damages in the amount **specified in the PCC** 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 PCC** as a percentage rate of the Contract Price. Once the “Maximum” is reached, the Employer may consider termination of the Contract, pursuant to GCC Sub-Clause 42.2.2.
- 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 Employer in respect thereof.
- 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.
- 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 thereby suffered by the Employer.
- 26.3 If the Contractor attains Completion of the Facilities or any part thereof before the Time for Completion or any extension thereof under GCC Clause 40, the Employer shall pay to the Contractor a bonus in the amount **specified in the PCC**. The aggregate amount of such bonus shall in no event exceed the amount **specified as “Maximum” in the PCC**.
- 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 PCC 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 Employer 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 defect or 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 Employer;
- (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 Employer 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 Employer 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 Employer, except for the work executed by the Employer under GCC Sub-Clause 27.7.

27.4 The Employer 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 Employer shall afford all reasonable opportunity for the Contractor to inspect any such defect.

27.5 The Employer 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 Employer, 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 Employer 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, whereupon the Contractor shall carry out such tests.

If such part fails the tests, the Contractor shall carry out 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 Employer and the Contractor.

27.7 If the Contractor fails to commence the work necessary to remedy such defect or 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 Employer may, following notice to the Contractor, proceed to do such work, and the reasonable costs incurred by the Employer in connection therewith shall be paid to the Employer by the Contractor or may be deducted by the Employer from any monies due the Contractor or claimed under the Performance Security.

27.8 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 Employer because of any of the aforesaid reasons.

27.9 Except as provided in GCC Clauses 27 and 33, the Contractor shall be under no liability whatsoever and howsoever arising, and whether under the Contract or 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 willful action of the Contractor.

27.10 In addition, any such component of the Facilities, and during the period of time as may be **specified in the PCC**, 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 thereof as may be necessary to meet at least the minimum level of such Guarantees. The Contractor shall notify the Employer upon completion of the necessary changes, modifications and/or additions, and shall request the Employer 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 Employer 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 thereof that are necessary to attain the Functional Guarantees at its cost and expense, and shall request the Employer to repeat the Guarantee Test or
- (b) pay liquidated damages to the Employer 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.

28.4 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 Employer 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 Employer's compliance with GCC Sub-Clause 29.2, indemnify and hold harmless the Employer 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 Employer 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 by reason of: (a) the installation of the Facilities by the Contractor or the use of the Facilities in the country where the Site is located; and (b) the sale of the products produced by the Facilities in any country.

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.

29.2 If any proceedings are brought or any claim is made against the Employer arising out of the matters referred to in GCC Sub-Clause 29.1, the Employer shall promptly give the Contractor a notice

thereof, and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer 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.

- 29.3 The Employer 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 Employer.

- 30. Limitation of Liability**
- 30.1 Except in cases of criminal negligence or willful misconduct,
- (a) neither Party shall be liable to the other Party, whether in contract, tort, or otherwise, for any indirect or 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 Employer, whether under the Contract, in tort or otherwise, shall not exceed the amount resulting from the application of the multiplier specified in the PCC, 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 Employer with respect to patent infringement.

G. Risk Distribution

- 31. Transfer of Ownership**
- 31.1 Ownership of the Plant (including spare parts) to be imported into the country where the Site is located shall be transferred to the Employer 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 the country where the Site is located shall be transferred to the Employer 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 Employer 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 thereto shall remain with the Contractor pursuant to GCC Clause 32 (Care of Facilities) hereof until Completion of the Facilities or the part thereof in which such Plant are incorporated.
- 32. Care of Facilities**
- 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 the country where the Site is located, nuclear reaction, nuclear radiation, radioactive contamination, pressure wave caused by aircraft or other aerial objects, or any other occurrences that an experienced contractor could not reasonably foresee, or if reasonably foreseeable could not reasonably make provision for or insure against, insofar 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 Employer or any third Party other than a Subcontractor, authorized by the Employer 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 Employer, or any such matter for which the Contractor has disclaimed responsibility herein,

the Employer 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 Employer 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 Employer in accordance with GCC Clause 39. If the Employer does not request the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Employer shall either request a change in accordance with GCC Clause 39, excluding the performance of that part of the Facilities thereby lost, destroyed or damaged, or, where the loss or damage affects a substantial part of the Facilities, the Employer 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

33.1 Subject to GCC Sub-Clause 33.3, the Contractor shall indemnify and hold harmless the Employer 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 Employer, its contractors, employees, officers or agents.

33.2 If any proceedings are brought or any claim is made against the Employer that might subject the Contractor to liability under GCC Sub-

Clause 33.1, the Employer shall promptly give the Contractor a notice thereof and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer 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.

33.3 The Employer 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 Employer, 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 act or failure of the Contractor.

33.4 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 Employer, 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 Employer'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.

(e) Workers' Compensation

In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

(f) Employer's Liability

In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

(g) Other Insurances

Such other insurances as may be specifically agreed upon by the Parties hereto as listed in the Appendix to the Contract Agreement titled Insurance Requirements.

- 34.2 The Employer 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 Employer'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 Employer'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 Employer 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 Employer 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 Employer 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 Employer 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 Employer shall provide copies of the policies taken out by the Employer 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 Employer 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 Employer shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Contractor. If the Employer 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 Employer 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 Employer. 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 Employer, and the Contractor shall have full recourse against the Employer for any and all liabilities of the Employer 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 Employer shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the Employer'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 Employer. With respect to insurance claims in which the Contractor's interest is involved, the Employer 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 Employer, 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;
 - (b) 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;
 - (c) 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 Employer and Contractor and decide upon the actions to be taken to overcome the physical conditions or artificial obstructions encountered. Following such consultations, the Project Manager shall instruct the Contractor, with a copy to the Employer, of the actions to be taken.
- 35.2 Any reasonable additional cost and expense incurred by the Contractor in following the instructions from the Project Manager to overcome such physical conditions or artificial obstructions referred to in GCC Sub-Clause 35.1 shall be paid by the Employer to the Contractor as an addition to the Contract Price.
- 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 Bid submission, in the country where the Site is located, 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 PCC pursuant to GCC Sub-Clause 11.2.
- 37. Force Majeure**
- 37.1 "Force Majeure" shall mean any event beyond the reasonable control of the Employer 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 labor, 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 fulfill 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 nonperformance 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 nonperformance 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 Employer 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 Employer 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 Employer 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 Employer 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 Employer 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 Employer
and so far as may be required by the Employer, 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 Employer does not require the Contractor to replace or make good any such destruction or damage to the Facilities, the Employer 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 Employer 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 Employer 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 Employer 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 Employer and the Contractor shall be specified in GCC Sub-Clauses 42.1.2 and 42.1.3.

H. 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 Employer 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 hereinafter 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 Employer may incur in implementing the value engineering proposal; and
- (c) a description of any effect(s) of the change on performance/functionality.

The Employer 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 Employer; or
- (c) improves the quality, efficiency, safety or sustainability of the Facilities; or
- (d) yields any other benefits to the Employer,

without compromising the necessary functions of the Facilities.

If the value engineering proposal is approved by the Employer 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 PCC 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 Employer's Requirements (Forms and Procedures).

39.2 Changes Originating from Employer

39.2.1 If the Employer 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: and
- (g) any additional documents as **specified in the PCC**.

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 Employer shall do one of the following:

- (a) accept the Contractor's estimate with instructions to the Contractor to proceed with the preparation of the Change Proposal
- (b) advise the Contractor of any part of its Estimate for Change Proposal that is unacceptable and request the Contractor to review its estimate

- (c) advise the Contractor that the Employer does not intend to proceed with the Change.

39.2.3 Upon receipt of the Employer'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 thereto shall agree on specific rates for the valuation of the Change.

39.2.5 If before or during the preparation of the Change Proposal it becomes apparent that the aggregate effect of compliance therewith 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 forth in Article 2 (Contract Price) of the Contract Agreement by more than fifteen percent (15%), the Contractor may give a written notice of objection thereto prior to furnishing the Change Proposal as aforesaid. If the Employer accepts the Contractor's objection, the Employer 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 herein, nor affect its right to take into 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.

39.2.6 Upon receipt of the Change Proposal, the Employer and the Contractor shall mutually agree upon all matters therein contained. Within fourteen (14) days after such agreement, the Employer shall, if it intends to proceed with the Change, issue the Contractor with a Change Order.

If the Employer 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 Employer 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.

39.2.7 If the Employer 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 Employer 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 thereafter 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.

39.3 Changes Originating from Contractor

39.3.1 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.

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 PCC 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 Employer under GCC Clause 41 hereof or reduction in the rate of progress pursuant to GCC Sub-Clause 41.2 or
 - (d) any changes in laws and regulations as provided in GCC Clause 36 or
 - (e) any default or breach of the Contract by the Employer, Appendix to the Contract Agreement titled ,or any activity, act or omission of the Employer, or the Project Manager, or any other contractors employed by the Employer, or
 - (c) 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
 - (d) delays attributable to the Employer or caused by customs, or
 - (e) 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 Employer and the Contractor shall agree upon the period of such extension. In the event that the Contractor does not accept the Employer'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 The Employer 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 thereafter and provided that at that time such performance is still suspended, the Contractor may give a notice to the Project Manager requiring that the Employer 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.

If the Employer 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 a part 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 42.1.

41.2 If

- (a) the Employer 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 Employer that requires payment of such sum, with interest thereon as stipulated in GCC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Employer to remedy the same, as the case may be. If the Employer 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 Employer, including but not limited to the Employer'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 Employer 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 Employer 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 Employer.

42. Termination

42.1 Termination for Employer's Convenience

42.1.1 The Employer 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 Employer 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 Employer pursuant to paragraph (d) (ii) below
- (c) remove all Contractor's Equipment from the Site, repatriate the Contractor's 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 Employer the parts of the Facilities executed by the Contractor up to the date of termination
 - (ii) to the extent legally possible, assign to the Employer 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 Employer, in any subcontracts concluded between the Contractor and its Subcontractors; and
 - (iii) deliver to the Employer 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 Employer 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 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 undertaken with third Parties in connection with the Contract and that are not covered by paragraphs (a) through (d) above.

42.2 Termination for Contractor's Default

42.2.1 The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefor to the Contractor, referring to this GCC Sub-Clause 42.2:

- (a) if the Contractor becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Contractor is a corporation, a resolution 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 Employer has engaged in Fraud and Corruption, as defined in paragraph 2.2 a. 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 Employer to proceed
- (c) persistently fails to execute the Contract in accordance with the Contract or 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 Employer that the Contractor can attain Completion of the Facilities by the Time for Completion as extended,

then the Employer 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 Employer may terminate the Contract forthwith 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 Employer 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 Employer pursuant to paragraph (d) below
- (c) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination
- (d) to the extent legally possible, assign to the Employer 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 Employer, in any subcontracts concluded between the Contractor and its Subcontractors
- (e) deliver to the Employer 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 Employer may enter upon the Site, expel the Contractor, and complete the Facilities itself or by employing any third Party. The Employer 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 Employer and with an indemnification by the Employer for all liability including damage or injury to persons arising out of the Employer'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 Employer considers expedient for the supply and installation of the Facilities.

Upon completion of the Facilities or at such earlier date as the Employer thinks appropriate, the Employer 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.

42.2.5 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 Employer 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.

42.2.6 If the Employer completes the Facilities, the cost of completing the Facilities by the Employer shall be determined.

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 Employer in completing the Facilities, exceeds the Contract Price, the Contractor shall be liable for such excess.

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 Employer, and if such excess is less than the sums due the Contractor under GCC Sub-Clause 42.2.5, the Employer shall pay the balance to the Contractor.

The Employer 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 Employer 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 Employer that requires payment of such sum, with interest thereon as stipulated in GCC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Employer to remedy the same, as the case may be. If the Employer 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 Employer, including but not limited to the Employer'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 Employer thereof, and if the Employer 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 Employer within twenty-eight (28) days of the said notice, the Contractor may by a further notice to the Employer referring to this GCC Sub-Clause 42.3.1, forthwith terminate the Contract.

42.3.2 The Contractor may terminate the Contract forthwith by giving a notice to the Employer to that effect, referring to this GCC Sub-Clause 42.3.2, if the Employer becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, being a corporation, if a resolution 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 Employer 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 Employer pursuant to paragraph (d) (ii)
- (c) remove all Contractor's Equipment from the Site and repatriate the Contractor's Personnel from the Site, and
- (d) subject to the payment specified in GCC Sub-Clause 42.3.4,
 - (i) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination
 - (ii) to the extent legally possible, assign to the Employer 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 Employer, in any subcontracts concluded between the Contractor and its Subcontractors, and
 - (iii) deliver to the Employer 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 Employer 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 Employer to the Contractor, account shall be taken of any sum previously paid by the Employer 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 Employer 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 Employer, to the country of the Employer 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 Employer 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 Employer's convenience pursuant to Sub-Clause 42.1.

I. 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.

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 Employer 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.

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 Employer'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.

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.

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.

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.

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.

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.

In the event that the Contractor and the Employer 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. Disputes and Arbitration **14.4.146.1 Appointment of the Dispute Board**

Disputes shall be referred to a DB for decision in accordance with GCC Sub-Clause 46.3. The Parties shall appoint a DB by the date stated in the PCC.

The DB shall comprise, as stated in the PCC, either one or three suitably qualified persons ("the members"), each of whom shall meet the criteria set forth in Sub-Clause 3 of Appendix A- General Conditions of Dispute Board Agreement. If the number is not so stated and the Parties do not agree otherwise, the DB shall comprise three persons, one of whom shall serve as chairman.

If the Contract is with a foreign Contractor, the DB members shall not have the same nationality as the Employer or the Contractor.

If the Parties have not jointly appointed the DB 21 days before the date stated in the PCC and the DB is to comprise three persons, each Party shall nominate one member for the approval of the other Party. The first two members shall recommend and the Parties shall agree upon the third member, who shall act as chairman.

However, if a list of potential members is included in the PCC, the members shall be selected from those on the list, other than anyone who is unable or unwilling to accept appointment to the DB.

The agreement between the Parties and either the sole member or each of the three members shall incorporate by reference the General Conditions of Dispute Board Agreement contained in the Appendix to these General Conditions, with such amendments as are agreed between them.

The DB shall be deemed to be constituted on the date the Parties and the sole member or the three members (as the case may be) of the DB have all signed a DB agreement.

The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DB consults, shall be mutually agreed upon by the Parties when agreeing the terms of appointment of the member or such expert (as the case may be). Each Party shall be responsible for paying one-half of this remuneration.

If a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon, as described in this Sub-Clause.

The appointment of any member may be terminated by mutual agreement of both Parties, but not by the Employer or the Contractor acting alone. Unless otherwise agreed by both Parties, the appointment of the DB (including each member) shall expire when the Operational Acceptance Certificate has been issued in accordance with GCC Sub-Clause 25.3.

14.4.246.2 Failure to Agree on the Composition of the Dispute Board

If any of the following conditions apply, namely:

- (a) the Parties fail to agree upon the appointment of the sole member of the DB by the date stated in the first paragraph of GCC Sub-Clause 46.1,
- (b) either Party fails to nominate a member (for approval by the other Party) of a DB of three persons by such date,
- (c) the Parties fail to agree upon the appointment of the third member (to act as chairman) of the DB by such date, or
- (d) the Parties fail to agree upon the appointment of a replacement person within 42 days after the date on which the sole member or one of the three members declines to act or is unable to act as a result of death, disability, resignation or termination of appointment,

then the appointing entity or official **named in the PCC** shall, upon the request of either or both of the Parties and after due consultation with both Parties, appoint this member of the DB. This appointment shall be final and conclusive. Each Party shall be responsible for paying one-half of the remuneration of the appointing entity or official.

14.4.346.3 Obtaining Dispute Board's Decision

If a dispute (of any kind whatsoever) arises between the Parties in connection with the performance of the Contract, 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 DB for its decision, with copies to the other Party and the Project Manager. Such reference shall state that it is given under this Sub-Clause.

For a DB of three persons, the DB shall be deemed to have received such reference on the date when it is received by the chairman of the DB.

Both Parties shall promptly make available to the DB all such additional information, further access to the Site, and appropriate facilities, as the DB may require for the purposes of making a decision on such dispute. The DB shall be deemed to be not acting as arbitrator(s).

Within 84 days after receiving such reference, or within such other period as may be proposed by the DB and approved by both Parties, the DB shall give its decision, which shall be reasoned and shall state that it is given under this Sub-Clause. The decision shall be binding on both Parties, who shall promptly give effect to it unless and until it shall be revised in an amicable settlement or an arbitral award as described below. Unless the Contract has already been abandoned, repudiated or terminated, the Contractor shall continue with the performance of the Facilities in accordance with the Contract.

If either Party is dissatisfied with the DB's decision, then either Party may, within 28 days after receiving the decision, give notice to the other Party of its dissatisfaction and intention to commence arbitration. If the DB fails to give its decision within the period of 84 days (or as otherwise approved) after receiving such reference, then either Party may, within 28 days after this period has expired, give notice to the other Party of its dissatisfaction and intention to commence arbitration.

In either event, this notice of dissatisfaction shall state that it is given under this Sub-Clause, and shall set out the matter in dispute and the reason(s) for dissatisfaction. Except as stated in GCC Sub-Clauses 46.6 and 46.7, neither Party shall be entitled to commence arbitration of a dispute unless a notice of dissatisfaction has been given in accordance with this Sub-Clause.

If the DB has given its decision as to a matter in dispute to both Parties, and no notice of dissatisfaction has been given by either Party within 28 days after it received the DB's decision, then the decision shall become final and binding upon both Parties.

14.4.446.4 Amicable Settlement

Where notice of dissatisfaction has been given under GCC Sub-Clause 46.3 above, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, arbitration may be commenced on or after the fifty-

sixth day after the day on which notice of dissatisfaction and intention to commence arbitration was given, even if no attempt at amicable settlement has been made.

14.4.546.5 Arbitration

Unless **indicated otherwise in the PCC**, any dispute not settled amicably and in respect of which the DB's decision (if any) has not become final and binding shall be finally settled by arbitration. Unless otherwise agreed by both Parties, arbitration shall be conducted as follows:

- (a) For contracts with foreign contractors:

unless otherwise specified in the PCC; the dispute shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce; by one or three arbitrators appointed in accordance with these Rules. The place of arbitration shall be the neutral location **stated in the PCC**; and the arbitration shall be conducted in the ruling language **stated in the PCC**;

and

- (b) For contracts with domestic contractors, arbitration with proceedings conducted in accordance with the laws of the Employer's Country.

The arbitrator(s) shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Project Manager, and any decision of the DB, relevant to the dispute. Nothing shall disqualify the Project Manager from being called as a witness and giving evidence before the arbitrator(s) on any matter whatsoever relevant to the dispute.

Neither Party shall be limited in the proceedings before the arbitrator(s) to the evidence or arguments previously put before the DB to obtain its decision, or to the reasons for dissatisfaction given in its notice of dissatisfaction. Any decision of the DB shall be admissible in evidence in the arbitration.

Arbitration may be commenced prior to or after completion of the Facilities. The obligations of the Parties, the Project Manager and the DB shall not be altered by reason of any arbitration being conducted during the progress of the execution of the Facilities.

14.4.646.6 Failure to Comply with Dispute Board's Decision

In the event that a Party fails to comply with a DB decision which has become final and binding, then the other Party may, without prejudice to any other rights it may have, refer the failure itself to arbitration under GCC Sub-Clause 46.5. GCC Sub-Clauses 46.3 and 46.4 shall not apply to this reference.

14.4.746.7 Expiry of Dispute Board's Appointment

If a dispute arises between the Parties in connection with the performance of the Contract, and there is no DB in place, whether by reason of the expiry of the DB's appointment or otherwise:

- (a) GCC Sub-Clauses 46.3 and 46.4 shall not apply, and
(b) the dispute may be referred directly to arbitration under GCC Sub-Clause 46.5

47. Cyber Security

14.4.847.1 Pursuant to the PCC, the Contractor including its Subcontractors/ suppliers/ manufacturers shall take all technical and organizational measures necessary to protect the information technology systems and data used in connection with the Contract. Without limiting the foregoing, the Contractor, including its Subcontractors/ suppliers/ manufacturers, shall use all reasonable efforts to establish, maintain, implement and comply with, reasonable information technology, information security, cyber security and data protection controls, policies and procedures, including oversight, access controls, encryption, technological and physical safeguards and business continuity/disaster recovery and security plans that are designed to protect against and prevent breach, destruction, loss, unauthorized distribution, use, access, disablement, misappropriation or modification, or other compromise or misuse of or relating to any information technology system or data used in connection with the Contract.

Appendix A

General Conditions of Dispute Board Agreement

1. Definitions

Each “Dispute Board Agreement” is a tripartite agreement by and between:

the “Employer”;

the “Contractor”; and

the “Member” who is defined in the Dispute Board Agreement as being:

- (i) the sole member of the “DB” and, where this is the case, all references to the “Other Members” do not apply, or
- (ii) one of the three persons who are jointly called the “DB” (or “dispute board”) and, where this is the case, the other two persons are called the “Other Members”.

The Employer and the Contractor have entered (or intend to enter) into a contract, which is called the “Contract” and is defined in the Dispute Board Agreement, which incorporates this Appendix. In the Dispute Board Agreement, words and expressions which are not otherwise defined shall have the meanings assigned to them in the Contract.

2. General Provisions

Unless otherwise stated in the Dispute Board Agreement, it shall take effect on the latest of the following dates:

- (a) the Commencement Date defined in the Contract,
- (b) when the Employer, the Contractor and the Member have each signed the Dispute Board Agreement, or
- (c) when the Employer, the Contractor and each of the Other Members (if any) have respectively each signed a dispute board agreement.

This employment of the Member is a personal appointment. At any time, the Member may give not less than 70 days’ notice of resignation to the Employer and to the Contractor, and the Dispute Board Agreement shall terminate upon the expiry of this period.

3. Warranties

The Member warrants and agrees that he/she is and shall be impartial and independent of the Employer, the Contractor and the Project Manager. The Member shall promptly disclose, to each of them and to the Other Members (if any), any fact or circumstance which might appear inconsistent with his/her warranty and agreement of impartiality and independence.

- a) When appointing the Member, the Employer and the Contractor relied upon the Member’s representations that he/she is:has at least a bachelor’s degree in relevant disciplines such as law, engineering, construction management or contract management;
- b) has at least ten years of experience in contract administration/management and dispute resolution, out of which at least five years of experience as an arbitrator or adjudicator in construction-related disputes;
- c) has received formal training as an adjudicator from an internationally recognized organization;
- d) has experience and/or is knowledgeable in the type of work which the Contractor is to carry out under the Contract;
- e) has experience in the interpretation of construction and/or engineering contract documents; and
- f) is fluent in the language for communications defined in GCC Sub-Clause 5.3 (or the language as agreed between the Parties and the DB).

4. General Obligations of the Member

The Member shall:

- (a) have no interest financial or otherwise in the Employer, the Contractor or the Project Manager, nor any financial interest in the Contract except for payment under the Dispute Board Agreement;
- (b) not previously have been employed as a consultant or otherwise by the Employer, the Contractor or the Project Manager, except in such circumstances as were disclosed in writing to the Employer and the Contractor before they signed the Dispute Board Agreement;
- (c) have disclosed in writing to the Employer, the Contractor and the Other Members (if any), before entering into the Dispute Board Agreement and to his/her best knowledge and recollection, any professional or personal relationships with any director, officer or employee of the Employer, the Contractor or the Project Manager, and any previous involvement in the overall project of which the Contract forms part;
- (d) not, for the duration of the Dispute Board Agreement, be employed as a consultant or otherwise by the Employer, the Contractor or the Project Manager, except as may be agreed in writing by the Employer, the Contractor and the Other Members (if any);
- (e) comply with the annexed procedural rules and with GCC Sub-Clause 46.3;
- (f) not give advice to the Employer, the Contractor, the Employer’s Personnel or the Contractor’s Personnel concerning the conduct of the Contract, other than in accordance with the annexed procedural rules;
- (g) not while a Member enter into discussions or make any agreement with the Employer, the Contractor or the Project Manager regarding employment by any of them, whether as a consultant or otherwise, after ceasing to act under the Dispute Board Agreement;
- (h) ensure his/her availability for all site visits and hearings as are necessary;
- (i) become conversant with the Contract and with the progress of the Facilities (and of any other parts of the project of which the Contract forms part) by studying all documents received which shall be maintained in a current working file;

- (j) treat the details of the Contract and all the DB's activities and hearings as private and confidential, and not publish or disclose them without the prior written consent of the Employer, the Contractor and the Other Members (if any); and
- (k) be available to give advice and opinions, on any matter relevant to the Contract when requested by both the Employer and the Contractor, subject to the agreement of the Other Members (if any).

5. General Obligations of the Employer and the Contractor

The Employer, the Contractor, the Employer's Personnel and the Contractor's Personnel shall not request advice from or consultation with the Member regarding the Contract, otherwise than in the normal course of the DB's activities under the Contract and the Dispute Board Agreement. The Employer and the Contractor shall be responsible for compliance with this provision, by the Employer's Personnel and the Contractor's Personnel respectively.

The Employer and the Contractor undertake to each other and to the Member that the Member shall not, except as otherwise agreed in writing by the Employer, the Contractor, the Member and the Other Members (if any):

- (a) be appointed as an arbitrator in any arbitration under the Contract;
- (b) be called as a witness to give evidence concerning any dispute before arbitrator(s) appointed for any arbitration under the Contract; or
- (c) be liable for any claims for anything done or omitted in the discharge or purported discharge of the Member's functions, unless the act or omission is shown to have been in bad faith.

The Employer and the Contractor hereby jointly and severally indemnify and hold the Member harmless against and from claims from which he is relieved from liability under the preceding paragraph.

Whenever the Employer or the Contractor refers a dispute to the DB under GCC Sub-Clause 46.3, which will require the Member to make a site visit and attend a hearing, the Employer or the Contractor shall provide appropriate security for a sum equivalent to the reasonable expenses to be incurred by the Member. No account shall be taken of any other payments due or paid to the Member.

6. Payment

The Member shall be paid as follows, in the currency named in the Dispute Board Agreement:

- (a) a retainer fee per calendar month, which shall be considered as payment in full for:
 - (i) being available on 28 days' notice for all site visits and hearings;
 - (ii) becoming and remaining conversant with all project developments and maintaining relevant files;
 - (iii) all office and overhead expenses including secretarial services, photocopying and office supplies incurred in connection with his duties; and
 - (iv) all services performed hereunder except those referred to in sub-paragraphs (b) and (c) of this Clause.

The retainer fee shall be paid with effect from the last day of the calendar month in which the Dispute Board Agreement becomes effective; until the last day of the calendar month in which the Taking-Over Certificate is issued for the whole of the Facilities.

With effect from the first day of the calendar month following the month in which Taking-Over Certificate is issued for the whole of the Facilities, the retainer fee shall be reduced by one third. This reduced fee shall be paid until the first day of the calendar month in which the Member resigns or the Dispute Board Agreement is otherwise terminated.

- (b) a daily fee which shall be considered as payment in full for:
 - (i) each day or part of a day up to a maximum of two days' travel time in each direction for the journey between the Member's home and the site, or another location of a meeting with the Other Members (if any);
 - (ii) each working day on site visits, hearings or preparing decisions; and
 - (iii) each day spent reading submissions in preparation for a hearing.
- (c) all reasonable expenses including necessary travel expenses (air fare in less than first class, hotel and subsistence and other direct travel expenses) incurred in connection with the Member's duties, as well as the cost of telephone calls, courier charges, faxes and telexes: a receipt shall be required for each item in excess of five percent of the daily fee referred to in sub-paragraph (b) of this Clause;
- (d) any taxes properly levied in the Country on payments made to the Member (unless a national or permanent resident of the Country) under this Clause 6.

The retainer and daily fees shall be as specified in the Dispute Board Agreement. Unless it specifies otherwise, these fees shall remain fixed for the first 24 calendar months and shall thereafter be adjusted by agreement between the Employer, the Contractor and the Member, at each anniversary of the date on which the Dispute Board Agreement became effective.

If the Parties fail to agree on the retainer fee or the daily fee the appointing entity or official named in the PCC shall determine the amount of the fees to be used.

The Member shall submit invoices for payment of the monthly retainer and air fares quarterly in advance. Invoices for other expenses and for daily fees shall be submitted following the conclusion of a site visit or hearing. All invoices shall be accompanied by a brief description of activities performed during the relevant period and shall be addressed to the Contractor.

The Contractor shall pay each of the Member's invoices in full within 56 calendar days after receiving each invoice and shall apply to the Employer (in the Statements under the Contract) for reimbursement of one-half of the amounts of these invoices. The Employer shall then pay the Contractor in accordance with the Contract.

If the Contractor fails to pay to the Member the amount to which he/she is entitled under the Dispute Board Agreement, the Employer shall pay the amount due to the Member and any other amount which may be required to maintain the operation of the DB; and without prejudice to the Employer's rights or remedies. In addition to all other rights arising from this default, the Employer shall be entitled to reimbursement of all sums paid in excess of one-half of these payments, plus all costs of recovering these sums and financing charges calculated at the rate specified in accordance with GCC Sub-Clause 12.3.

If the Member does not receive payment of the amount due within 70 days after submitting a valid invoice, the Member may (i) suspend his/her services (without notice) until the payment is received, and/or (ii) resign his/her appointment by giving notice under Clause 7.

7. Termination

At any time: (i) the Employer and the Contractor may jointly terminate the Dispute Board Agreement by giving 42 days' notice to the Member; or (ii) the Member may resign as provided for in Clause 2.

If the Member fails to comply with the Dispute Board Agreement, the Employer and the Contractor may, without prejudice to their other rights, terminate it by notice to the Member. The notice shall take effect when received by the Member.

If the Employer or the Contractor fails to comply with the Dispute Board Agreement, the Member may, without prejudice to his other rights, terminate it by notice to the Employer and the Contractor. The notice shall take effect when received by them both.

Any such notice, resignation and termination shall be final and binding on the Employer, the Contractor and the Member. However, a notice by the Employer or the Contractor, but not by both, shall be of no effect.

8. Default of the Member

If the Member fails to comply with any of his obligations under Clause 4 concerning his impartiality or independence in relation to the Employer or the Contractor, he/she shall not be entitled to any fees or expenses hereunder and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses received by the Member and the Other Members (if any), for proceedings or decisions (if any) of the DB which are rendered void or ineffective by the said failure to comply.

9. Disputes

Any dispute or claim arising out of or in connection with this Dispute Board Agreement, or the breach, termination or invalidity thereof, shall be finally settled by institutional arbitration. If no other arbitration institute is agreed, the arbitration shall be conducted under the Rules of Arbitration of the International Chamber of Commerce by one arbitrator appointed in accordance with these Rules of Arbitration.

Appendix B

Dispute Board Guidelines

1. Unless otherwise agreed by the Employer and the Contractor, the DB shall visit the site at intervals of not more than 140 days, including times of critical construction events, at the request of either the Employer or the Contractor. Unless otherwise agreed by the Employer, the Contractor and the DB, the period between consecutive visits shall not be less than 70 days, except as required to convene a hearing as described below.
2. The timing of and agenda for each site visit shall be as agreed jointly by the DB, the Employer and the Contractor, or in the absence of agreement, shall be decided by the DB. The purpose of site visits is to enable the DB to become and remain acquainted with the progress of the execution of the Contract and of any actual or potential problems or claims, and, as far as reasonable, to prevent potential problems or claims from becoming disputes.
3. Site visits shall be attended by the Employer, the Contractor and the Project Manager and shall be coordinated by the Employer in co-operation with the Contractor. The Employer shall ensure the provision of appropriate conference facilities and secretarial and copying services. At the conclusion of each site visit and before leaving the site, the DB shall prepare a report on its activities during the visit and shall send copies to the Employer and the Contractor.
4. The Employer and the Contractor shall furnish to the DB one copy of all documents which the DB may request, including Contract documents, progress reports, variation instructions, certificates and other documents pertinent to the performance of the Contract. All communications between the DB and the Employer or the Contractor shall be copied to the other Party. If the DB comprises three persons, the Employer and the Contractor shall send copies of these requested documents and these communications to each of these persons.
5. If any dispute is referred to the DB in accordance with GCC Sub-Clause 46.3, the DB shall proceed in accordance with GCC Sub-Clause 46.3 and these Guidelines. Subject to the time allowed to give notice of a decision and other relevant factors, the DB shall:
 - (a) act fairly and impartially as between the Employer and the Contractor, giving each of them a reasonable opportunity of putting his case and responding to the other's case, and
 - (b) adopt procedures suitable to the dispute, avoiding unnecessary delay or expense.
6. The DB may conduct a hearing on the dispute, in which event it will decide on the date and place for the hearing and may request that written documentation and arguments from the Employer and the Contractor be presented to it prior to or at the hearing.
7. Except as otherwise agreed in writing by the Employer and the Contractor, the DB shall have power to adopt an inquisitorial procedure, to refuse admission to hearings or audience at hearings to any persons other than representatives of the Employer, the Contractor and the Project Manager, and to proceed in the absence of any Party who the DB is satisfied received notice of the hearing; but shall have discretion to decide whether and to what extent this power may be exercised.
8. The Employer and the Contractor empower the DB, among other things, to:
 - (a) establish the procedure to be applied in deciding a dispute,
 - (b) decide upon the DB's own jurisdiction, and as to the scope of any dispute referred to it,
 - (c) conduct any hearing as it thinks fit, not being bound by any rules or procedures other than those contained in the Contract and these Guidelines,
 - (d) take the initiative in ascertaining the facts and matters required for a decision,
 - (e) make use of its own specialist knowledge, if any,
 - (f) decide upon the payment of financing charges in accordance with the Contract,
 - (g) decide upon any provisional relief such as interim or conservatory measures,
 - (h) open up, review and revise any certificate, decision, determination, instruction, opinion or valuation of the Project Manager, relevant to the dispute, and
 - (i) appoint, should the DB so consider necessary and the Parties agree, a suitable expert/s (including legal and technical expert(s)) at the cost of the Parties to give advice on a specific matter/s relevant to the dispute.
9. The DB shall not express any opinions during any hearing concerning the merits of any arguments advanced by the Parties. Thereafter, the DB shall make and give its decision in accordance with GCC Sub-Clause 46.3, or as otherwise agreed by the Employer and the Contractor in writing. If the DB comprises three persons:
 - (a) it shall convene in private after a hearing, in order to have discussions and prepare its decision;
 - (b) it shall endeavor to reach a unanimous decision: if this proves impossible the applicable decision shall be made by a majority of the Members, who may require the minority Member to prepare a written report for submission to the Employer and the Contractor; and
 - (c) if a Member fails to attend a meeting or hearing, or to fulfil any required function, the other two Members may nevertheless proceed to make a decision, unless:
 - (i) either the Employer or the Contractor does not agree that they do so, or
 - (ii) the absent Member is the chairman and he/she instructs the other Members to not make a decision.

Appendix C

Fraud and Corruption

1. Purpose

1.1 The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.3 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders (applicants/proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.4 To this end, the Bank:

- a. Defines, for the purposes of this provision, the terms set forth below as follows:
 - i. "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;
 - ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;
 - iii. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;
 - iv. "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;
 - v. "obstructive practice" is:
 - (a) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
 - (b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.
- b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;
- c. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement process, selection and/or execution of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- d. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;¹ (ii) to be a nominated² sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;
- e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders (applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents, personnel, permit the Bank to inspect³ all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

¹ For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

² A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

³ Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

Appendix D

Metrics for Progress Reports- Environmental and Social (ES)

Metrics for regular reporting:

- a. *environmental incidents or non-compliances with contract requirements, including contamination, pollution or damage to ground or water supplies;*
- b. *health and safety incidents, accidents, injuries that require treatment and all fatalities;*
- c. *interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none);*
- d. *status of all permits and agreements:*
 - (i) work permits: number required, number received, actions taken for those not received;
 - (ii) status of permits and consents:
 - list areas/facilities with permits required (quarries, asphalt & batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to resident engineer (or equivalent), status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.);
 - list areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, dates submitted to resident engineer (or equivalent);
 - identify major activities undertaken in each area in the reporting period and highlights of environmental and social protection (land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation);
 - for quarries: status of relocation and compensation (completed, or details of activities and current status in the reporting period).
- e. *health and safety supervision:*
 - (i) safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;
 - (ii) number of workers, work hours, metric of PPE use (percentage of workers with full personal protection equipment (PPE), partial, etc.), worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);
- f. *worker accommodations:*
 - (i) number of expats housed in accommodations, number of locals;
 - (ii) date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;
 - (iii) actions taken to recommend/require improved conditions, or to improve conditions.
- g. *Health services: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);*
- h. *gender (for expats and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);*
- i. *training:*
 - (i) number of new workers, number receiving induction training, dates of induction training;
 - (ii) number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;
 - (iii) number and dates of communicable diseases (including STDs) sensitization and/or training, no. workers receiving training (in the reporting period and in the past); same questions for gender sensitization, flag person training.
 - (iv) number and date of SEA prevention and SH sensitization and/or training events, including number of workers receiving training on Code of Conduct for Contractor's Personnel (in the reporting period and in the past), etc.
- j. *environmental and social supervision:*
 - (i) environmentalist: days worked, areas inspected and numbers of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, swamps, forest crossings, etc.), highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to environmental and/or social specialist/construction/site management;
 - (ii) sociologist: days worked, number of partial and full site inspections (by area: road section, work camp, accommodations, quarries, borrow areas, spoil areas, clinic, HIV/AIDS center, community centers, etc.), highlights of activities (including violations of environmental and/or social requirements observed, actions taken), reports to environmental and/or social specialist/construction/site management; and
 - (iii) community liaison person(s): days worked (hours community center open), number of people met, highlights of activities (issues raised, etc.), reports to environmental and/or social specialist /construction/site management.
- k. *Grievances: list new grievances (e.g., number of allegations of SEA and SH) received in the reporting period and number of unresolved past grievances by date received, complainant's age and sex, how received, to whom referred to for action, resolution and date (if completed), data resolution reported to complainant, any required follow-up (Cross-reference other sections as needed):*
 - (i) Worker grievances;
 - (ii) Community grievances
- l. *Traffic, road safety and vehicles/equipment:*
 - (i) traffic and road safety incidents and accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;
 - (ii) traffic and road safety incidents and accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;
 - (iii) overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).
- m. *Environmental mitigations and issues (what has been done):*

- (i) dust: number of working bowzers, number of waterings/day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); % of rock/ spoil lorries with covers, actions taken for uncovered vehicles;
 - (ii) erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to resolve issues, emergency repairs needed to control erosion/sedimentation;
 - (iii) quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental and social protection: land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation;
 - (iv) blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), incidents of off-site damage or complaints (cross-reference other sections as needed);
 - (v) spill clean-ups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination);
 - (vi) waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;
 - (vii) details of tree plantings and other mitigations required undertaken in the reporting period;
 - (viii) details of water and swamp protection mitigations required undertaken in the reporting period.
- n. compliance:*
- (i) compliance status for conditions of all relevant consents/permits, for the Work, including quarries, etc.): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;
 - (ii) compliance status of C-ESMP/ESIP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
 - (iii) compliance status of SEA and SH prevention and response action plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
 - (iv) compliance status of Health and Safety Management Plan re: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
 - (v) other unresolved issues from previous reporting periods related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc. Cross-reference other sections as needed.

Appendix E

Sexual Exploitation and Abuse (SEA) and/or Sexual Harassment (SH) Performance Declaration for Subcontractors

[The following table shall be filled in by each subcontractor proposed by the Contractor, that was not named in the Contract]

Subcontractor's	Name:		[insert		full		name]	
Date:	[insert		day,		month,		year]	
Contract	reference		[insert		contract		reference]	
Page	[insert	page	number]	of	[insert	total	number]	pages

SEA and/or SH Declaration
We: ☐ (a) have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. ☐ (b) are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. ☐ (c) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor.
[If (c) above is applicable, attach evidence of an arbitral award reversing the findings on the issues underlying the disqualification.]

Name of the Subcontractor_____

Name of the person duly authorized to sign on behalf of the Subcontractor_____

Title of the person signing on behalf of the Subcontractor_____

Signature of the person named above_____

Date signed _____ day of _____, _____

Countersignature of authorized representative of the Contractor:

Signature: _____

Date signed _____ day of _____, _____

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Section IX - Particular Conditions of Contract

The following Particular 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.

Particular Conditions of Contract (PCC)

The following Particular Conditions (PCC) shall supplement the General Conditions (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the GCC. The clause number of the PCC is the corresponding clause number of the GCC.

PCC 1. Definitions	The Employer is: ZESCO Limited The Project Manager is: Hilner Mulapani The Bank is: World Bank Country of Origin: all countries and territories as indicated in Section V of the bidding document, Eligible Countries.	
PCC 5. Law and Language	PCC 5.1	The Contract shall be interpreted in accordance with the laws of: Zambia
	PCC 5.2	The ruling language is: English
	PCC 5.3	The language for communications is: English
PCC 7. Scope of Facilities [Spare Parts] (GCC Clause 7)	PCC 7.3	The Contractor agrees to supply spare parts for a period of years: Ten (10) Years
PCC 8. Time for Commencement and Completion	PCC 8.1	The Contractor shall commence work on the Facilities within 15 days (two weeks) from the Effective Date for determining Time for Completion as specified in the Contract Agreement.
	PCC 8.2	The Time for Completion of the whole of the Facilities shall be Twenty-Four (24) months (two years) from the Effective Date as described in the Contract Agreement.
PCC 9. Contractor's Responsibilities	Reference: <u>Sustainable Procurement in World Bank-financed IPF Projects</u> (2023) PCC 9.8 The following sustainable procurement contractual provisions apply: (i) Resource efficiency and pollution prevention; (ii) Materials selection and waste minimization; (iii) Sustainable sourcing of timber and wood products; (iv) Hire local (Zambian) enterprises at least 20% through sub-contracts of tower erection works and at least 50% through sub-contracts of bush clearing works; (v) Preferably hire greater number of women employees and at least one local enterprises should have 25% women ownership for supply of materials, services or installation works; These sustainable procurement obligations are contractually binding and shall be applied to the Contractor's supply chain and Subcontractors, consistent with the Contractor's ES Management Strategies and Implementation Plans.	
PCC 11. Contract Price	PCC 11.2	The Contract Price shall be adjusted in accordance with the provisions of the Appendix 2 to the Contract Agreement titled Price Adjustment.
PCC 12. Terms of Payment	PCC 12.5	There are no Special Conditions of Contract applicable to GCC Sub- Clause 12.5"
PCC 13. Securities	PCC 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: Ten percent (10%) of the total contract sum.
	PCC 13.3.2	The Performance Security shall be in the form of the Bank Guarantee attached hereto in Section X, Contract Forms.
	PCC 13.3.3	The Performance Security shall not be reduced on the date of the Operational Acceptance.
		The Performance Security shall be reduced to ten percent (10%) of the value of the component covered by the extended defect liability to cover the Contractor's extended defect

	liability in accordance with the provision in the PCC, pursuant to GCC Sub-Clause 27.10.
PCC 18. Progress Report	PCC 18.3 Progress reports shall include status of compliance to cyber security risks management, and any foreseeable cyber security risk and mitigation. Cyber security incidents to be immediately reported. The forestated cybersecurity compliance requirements are mandatory.
PCC 20 Design and Engineering	PCC 20.3.2 Replace fourteen (14) days with twenty-one (21) days
PCC 22 Installation	PCC22.2.5 Working Hours Normal working hours are: 48 Hours per Week
PCC 25. Commissioning and Operational Acceptance	a) Type test, guarantee test, and FAT are verified at factory as per Section 7 – Employer’s Requirements, Chapter 10 (Testing & Inspection), prior to shipment. (b) Operational Acceptance shall require: (i) completion of installation and pre-commissioning; (ii) a 7-day soak; and (iii) a 14-day live operation meeting ER §8.4 performance criteria. (c) Long-term reliability is governed by GCC 27 (Defect Liability).
PCC 26. Completion Time Guarantee	PCC 26.2 Applicable rate for liquidated damages: <i>Zero-point five percent (0.5% per week of delay)</i> 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 the Contract Value PCC 26.3 No bonus will be given for earlier Completion of the Facilities or part thereof.
PCC 27. Defect Liability	PCC 27.2 Replace the first paragraph with the following: “The Defect Liability Period shall be twenty-four (24) months from the date of Operational Acceptance of the Facilities (or any part thereof) except for as specified in GCC 27.10.” PCC 27.10 The critical components covered under the extended defect liability are <u> N/A </u>, and the period shall be <u> N/A </u>
PCC 30. Limitation of Liability	PCC 30.1 (b) The multiplier of the Contract Price is: 1.1 times.
PCC 39. Change in the Facilities	PCC 39.1.2 If the value engineering proposal is approved by the Employer the amount to be paid to the Contractor shall be 50% of the reduction in the Contract Price.
PCC 39.2.1	(g) Sufficient information to enable assessment of cyber security risks.
PCC46. Disputes and Arbitration	PCC 46.1 The DB shall be appointed within 60 days after signature by both parties of the Contract Agreement PCC 46.1 The DB shall be: <i>Three members</i> PCC 46.1 List of potential DB members: Proposed by Employer [Attach CVs to the Contract] 1. _____

	2. _____ 3. _____ Proposed by Contractor <i>[Attach CVs to the Contract]</i> 1. _____ 2. _____ 3. _____ PCC 46.2 Appointment (if not agreed) to be made by: International Chamber of Commerce PCC 46.5 Procedure to settle disputes in respect of DB’s decisions: Rules of arbitration GCC Sub-Clause 46.5(a) shall apply. Ruling language shall be: English. The seat of Arbitration shall be Cape Town, Republic of South Africa. GCC Sub-Clause 46.5 (b): shall apply.
PCC 47.	GCC 47.1 - Cyber Security applies.

Section X – Contract Forms

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Notification of Intention of Award

[This Notification of Intention to Award shall be sent to each Bidder that submitted a Bid, unless the Bidder has previously received notice of exclusion from the process at an interim stage of the procurement process]

[Send this Notification to the Bidder’s Authorized Representative named in the Bidder Information Form]

For the attention of Bidder’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 all participating Bidders. The Notification must be sent to all Bidders 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

Employer: [insert the name of the Employer]
Project: [insert name of project]
Contract title: [insert the name of the contract]
Country: [insert country where RFB is issued]
Loan No. /Credit No. / Grant No.: [insert reference number for loan/credit/grant]
RFB No: ZM-ZESCO-495219-CW-RFB

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 Bid, and/or
- b) submit a Procurement-related Complaint in relation to the decision to award the contract.

1. The successful Bidder

Name:	[insert name of successful Bidder]
Address:	[insert address of the successful Bidder]
Contract price:	[insert contract price of the successful Bid]
Total combined score:	[insert the total combined score of the successful Bidder]

2. Other Bidders [INSTRUCTIONS: insert names of all Bidders that submitted a Bid, Bid prices as read out and evaluated, technical scores and combined scores.]

Name of Bidder	Technical Score	Bid Price	Evaluated Cost	Bid	Combined Score
[insert name]	[insert Technical score]	[insert price] Bid	[insert evaluated cost]		[insert combined score]
[insert name]	[insert Technical score]	[insert price] Bid	[insert evaluated cost]		[insert combined score]
[insert name]	[insert Technical score]	[insert price] Bid	[insert evaluated cost]		[insert combined score]
[insert name]	[insert Technical score]	[insert price] Bid	[insert evaluated cost]		[insert combined score]
[insert name]	[insert Technical score]	[insert price] Bid	[insert evaluated cost]		[insert combined score]

3. Reason/s why your Bid was unsuccessful[Delete if the combined score already reveals the reason]

[INSTRUCTIONS: State the reason/s why this Bidder's Bid was unsuccessful. Do NOT include: (a) a point by point comparison with another Bidder's Bid or (b) information that is marked confidential by the Bidder in its Bid.]

4. 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 Bid. 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 Bidder, 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 Employer]*

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.

5. How to make a complaint

DEADLINE:: The deadline for submitting a Procurement-related Complaint challenging the decision to award the contract expires on midnight, *[insert date]* (local time).

Provide the contract name, reference number, name of the Bidder, 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 Employer]*

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:

For more information see the [Procurement Regulations for IPF Borrowers \(Procurement Regulations\)](#) (Annex III). You should read these provisions before preparing and submitting your complaint. In addition, the World Bank's Guidance "[How to make a Procurement-related Complaint](#)" provides a useful explanation of the process, as well as a sample letter of complaint.

In summary, there are four essential requirements:

1. You must be an 'interested party'. In this case, that means a Bidder who submitted a Bid in this procurement 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 deadline stated above.
4. You must include, in your complaint, all of the information required by the Procurement Regulations (as described in Annex III).

6. 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. This may happen where we are unable to provide a debriefing within the five (5) Business Day deadline. If this happens we will notify you of the extension

If you have any questions regarding this Notification please do not hesitate to contact us.

On behalf of the Employer:

Signature: _____

Name: _____

Title/position: _____

Telephone: _____

Email: _____

Beneficial Ownership Disclosure Form

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE FORM

This Beneficial Ownership Disclosure Form (“Form”) is to be completed by the successful Bidder. In case of joint venture, the Bidder 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 Bidder is any natural person who ultimately owns or controls the Bidder by meeting one or more of the following conditions:

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder

RFB No.: [insert number of RFB process]

Request for Bid No.: [insert identification]

To: [insert complete name of Employer]

In response to your request in the Letter of Acceptance dated [insert date of letter of Acceptance] to furnish additional information on beneficial ownership:
[select one option as applicable and delete the options that are not applicable]

(i) we hereby provide the following beneficial ownership information.

Identity of Beneficial Owner	Directly or indirectly holding 25% or more of the shares (Yes / No)	Directly or indirectly holding 25 % or more of the Voting Rights (Yes / No)	Directly or indirectly having the right to appoint a majority of the board of the directors or an equivalent governing body of the Bidder (Yes / No)
[include full name (last, middle, first), nationality, country of residence]			

OR

(ii) We declare that there is no Beneficial Owner meeting one or more of the following conditions:

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder

OR

(iii) We declare that we are unable to identify any Beneficial Owner meeting one or more of the following conditions. [If this option is selected, the Bidder shall provide explanation on why it is unable to identify any Beneficial Owner]

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder]

Name of the Bidder: *[insert complete name of the Bidder]

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

Title of the person signing the Bid: [insert complete title of the person signing the Bid]

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]

* In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder. In the event that the Bidder is a joint venture, each reference to “Bidder” in the Beneficial Ownership Disclosure Form (including this Introduction thereto) shall be read to refer to the joint venture member.

** Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

Letter of Acceptance

To: _____

This is to notify you that your Bid dated _____ for execution of the _____ for the Contract Price in the aggregate of _____, as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish (i) the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms and (ii) the additional information on beneficial ownership in accordance with ITB 46.1, within eight (8) Business days using the Beneficial Ownership Disclosure Form, included in Section X, - Contract Forms, of the bidding 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 Employer”), and (2) _____, a corporation incorporated under the laws of _____ and having its principal place of business at _____ (hereinafter called “the Contractor”).

WHEREAS the Employer 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 hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

Article 1. Contract Documents

1.1 Contract Documents (Reference GCC Clause 2)

The following documents shall constitute the Contract between the Employer 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) Letter of Bid and Price Schedules submitted by the Contractor
- (c) Particular Conditions
- (d) General Conditions
- (e) Employer’s Requirements
- (f) Drawings
- (g) Other completed Bidding forms submitted with the Bid
- (i) Any other documents forming part of the contract, including, but not limited to:
 - i. the ES Management Strategies and Implementation Plans; and
 - ii. Code of Conduct for Contractor’s Personnel (ES).

[Any other documents shall be added here.]

1.2 Order of Precedence (Reference GCC Clause 2)

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 Article 1.1 (Contract Documents) above.

1.3 Definitions (Reference GCC Clause 1)

Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions.

Article 2. Contract Price and Terms of Payment

2.1 Contract Price (Reference GCC Clause 11)

The Employer 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 Employer will reimburse the Contractor are given in the Appendix (Terms and Procedures of Payment) hereto.

The Employer 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 Employer shall arrange for the documentary credit to be amended accordingly.

Article 3. Effective Date 3.1 Effective Date (Reference GCC Clause 1)

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 Employer and the Contractor;
- (b) The Contractor has submitted to the Employer the Performance Security and the Advance Payment Guarantee;
- (c) The Employer has paid the Contractor the advance payment;
- (d) The Contractor has been advised that the documentary credit, if applicable, referred to in Article 2.2 above has been issued in its favor;
- (e) constitution of the DB.

Each party shall use its best efforts to fulfill 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 (if Fixed Price contract) and the Time for Completion and/or other relevant conditions of the Contract.

Article Communications 4. 4.1 The address of the Employer for notice purposes, pursuant to GCC 4.1 is: _____.

- 4.2 The address of the Contractor for notice purposes, pursuant to GCC 4.1 is: _____.

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 hereto, and the Contract shall be read and construed accordingly.

IN WITNESS WHEREOF the Employer 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 Employer

[Signature]

[Title]

in the presence of _____

Signed by, for and on behalf of the Contractor

[Signature]

[Title]

in the presence of _____

APPENDICES

- 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 Employer
- Appendix 7 List of Documents for Approval or Review
- Appendix 8 Functional Guarantees

Appendix 1 – Terms and Procedures of Payment

In accordance with the provisions of GCC Clause 12 (Terms of Payment), the Employer shall pay the Contractor in the following manner and at the following times, on the basis of the Price Breakdown given in the section on Price Schedules. Payments will be made in the currencies quoted by the Bidder 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 Employer. 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 the Employer’s Country

In respect of plant and equipment supplied from within the Employer’s Country, 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 favor of the Employer. 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 favor of the Employer.

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 Employer. 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 Employer’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 Employer’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 Employer’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 Employer fails to make any payment on its respective due date, the Employer shall pay to the Contractor interest on the amount of such delayed payment at the rate of **SOFR Plus Two percent (2%)** 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:

- (i) Contractor Submits Proforma Invoice/s along with application for payment;
- (ii) Project Manager Reviews/Certifies/Approves Payment Application
- (iii) Contractor Submits Tax Invoice to Finance for Payment Processing
- (iv) Payment Processed by Treasury in Accordance with agreed Terms of Payment

The Contractor shall submit a Statement in Six (6) copies to the Project Manager after the end of each month, in a form approved by the Project Manager, showing in detail the amounts to which the Contractor considers himself to be entitled, together with supporting documents including the Billing Breakup.

No amount shall be certified or paid until the Employer has received and approved the Performance Security. Thereafter, the Project Manager shall, within 28 days after receiving a Statement and supporting documents, deliver to the Employer a Payment Certificate which shall state the amount which the Project Manager fairly determines to be due, with all supporting particulars for any reduction or withholding made by the Project Manager on the Statement if any.

The Contractor shall be responsible for any error in the Statement.

Appendix 2 – 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 material components, in accordance with the following formula:

$$P_1 = P_0 \times \left(a + b \frac{C_1}{C_0} + c \frac{A_1}{A_0} + d \frac{Al_1}{Al_0} + e \frac{RS_1}{RS_0} + f \frac{S_1}{S_0} + g \frac{St_1}{St_0} + h \frac{FU_1}{FU_0} \right) - P_0$$

in which:

- P_1 = adjustment amount payable to the Contractor
- P_0 = Contract price (base price)
- a = Percentage of fixed element in Contract Price ($a = 15\%$)
- b = Percentage of Cement component in Contract Price ($b = \%$)
- c = Percentage of Aggrigate component in Contract Price ($c = \%$)
- d = Percentage of Aluminium component in Contract Pprice ($d = \%$)
- e = Percentage of Reinforcing Steel component in Contract Price ($e = \%$)
- f = Percentage of Steel component in Contract Price ($f = \%$)
- g = Percentage of Structural Steel component in Contract Price ($g = \%$)
- h = Percentage of Fuel component in Contract Price ($h = \%$)
- C_0, C_1 = Cement indices applicable to the appropriate industry in the country of origin on the base date and the date for adjustment, respectively
- A_0, A_1 = Aggrigate indices in the country of origin on the base date and the date for adjustment, respectively
- Al_0, Al_1 =Aluminium indices in the country of origin on the base date and the date for adjustment, respectively
- RS_0, RS_1 = Reinforcing Steel indices in the country of origin on the base date and the date for adjustment, respectively
- S_0, S_1 = Steel indices in the country of origin on the base date and the date for adjustment, respectively
- St_0, St_1 =Structure Steel indices in the country of origin on the base date and the date for adjustment, respectively
- FU_0, FU_1 = Fuel indices in the Employer’s country on the base date and the date for adjustment, respectively

The material and equipment indices may consist of several components, however for this contract the following material shall be comprised without alteration: **Cement, Aggregate, Aluminium, Steel, Reinforcing Steel, Steel Structure, Fuel.**

N.B. $a+b+c+d+e+f+g+h = 100\%$.

Conditions Applicable To Price Adjustment

The Bidder shall indicate the source of labor and materials indices¹, and source of exchange rate (if applicable) and the base date indices in its Bid. The source(s) of applicable indices shall be those from an official and recognisable institution of the country, which the item is purchased from or manufactured in. The indices must be available on a web site to be specified.

<u>Item</u>	<u>Source of Indices Used</u>	<u>Base Date Indices</u>	<u>Web site</u>

The base date shall be the date thirty (30) days prior to the Bid Submission date.

The Price Adjustment Date shall be 49 days prior to the day of the last period (to which the particular Payment Cer-tificate relates) in line with Clause 13.8 of the FIDIC (Yel-low Book) Conditions of Contract.

The amount payable to the Contractor and valued at base rates and prices in the Payment Certificates issued by the Consultant shall be adjusted in respect of the rise or fall in the indexed costs of materials and other inputs to the Works as indicated in the Price Adjustment Formula, as prescribed in this Clause.

¹ Supply from Abroad must not be linked to Zambian indices.

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 Employer under the terms of the Contract. No price increase will be allowed for periods of delay for which the Contractor is responsible. The Employer will, however, be entitled to any price decrease occurring during such periods of delay.

(b) If the currency in which the Contract price, P_0 , 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: Z_0 / Z_1 , 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 Employer, 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	110% of the Contract Price for the Plant and Equipment shipped
Deductible limits	5% of the value of shipment and shall be borne by the contractor
Parties Insured	Contractor plus Employer as co-insured
From	Manufacturers' Works
To	Location(s) of site(s) of the project

(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	The insuring party shall insure that the Works, Plant, Materials, and Contractor's documents for not less than the full reinstatement costs.
Deductible limits	2% of the Contract Price and shall be borne by the contractor.
Parties Insured	Contractor plus Employer and Subcontractor as co-insured
From	Date of arrival of first Plant and Equipment at the site
To	End of Defects Liability Period

(c) Third Party Liability Insurance

Covering bodily injury or death suffered by third parties (including the Employer's personnel) and loss of or damage to property (including the Employer's property and any parts of the Facilities that have been accepted by the Employer) occurring in connection with the supply and installation of the Facilities.

Amount	USD 2,500,000
Deductible limits	10% (max.) and shall be borne by the Contractor.
Parties Insured	Contractor plus Subcontractor as co-insured
From	Effective date of the Contract
To	Operational Acceptance

(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) Employer'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 for the following insurances:

Details:

Amount	To be indicated by the contractor
Deductible limits	Nil
Parties Insured	Contractor plus Subcontractor as co-insured
From	Receipt at site
To	Up to Defects Liability Period

The Employer 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 Employer’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 Employer’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 Employer

The Employer shall at its expense take out and maintain in effect during the performance of the Contract the following insurances.

Details: **NIL**

Appendix 4 – Time Schedule

4.1 Description of Facilities

S/N	Item Description	Completion Time required by the Employer from the Effective Date	Completion date guaranteed by the Bidder from the effective date
1	Package-3: Design, Supply and Installation for: i) Double circuit 330 kV Kasama-Nakonde overhead transmission line, 212km length, ii) Double circuit 400 kV overhead transmission line from Nakonde to the Tanzanian border,15km length (charged at 330 kV), and iii) Double circuit 132 kV Isoka-Nakonde (loop in and out of 66 kV Isoka - Nakonde line) overhead transmission line,13km length,	Twenty-four (24) Months	

4.2 The activities under the Contractor’s program for Project Completion shall be in the form of a master network (MNW) and shall identify the various activities like design, engineering, manufacturing, supply, installation, factory testing, transportation to site, site testing and commissioning, trial operation and taking over etc. of the facilities or specific part thereof (where specific parts are specified in PCC). The network shall conform to the above Project Completion Schedule. This master network will be discussed and agreed before Kick-off meeting in line with the above. The detailed network(s) and project implementation plans & programs shall preferably be prepared in Primavera or in MS Project or in the latest Project Management tool as convenient to the Employer and shall form part of the contract.

4.3 The Employer reserves the right to request minor changes in the work schedule at the time of Award of Contract to the successful Bidder.

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 Employer 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 Employer and their names have been added to this list of Approved Subcontractors.

Major Items of Plant and Installation Services	Approved Subcontractors/Manufacturers	Nationality
Transmission Line Equipment:		
400kV OHTL: ACSR 'Bluejay' Conductor		
400kV OHTL: ACSR 'Bluejay' conductor accessories and fittings		
400kV OHTL: ACSR 95/55 Shield Wire		
400kV OHTL: ACSR 95/55 Shield Wire accessories and fittings		
400kV OHTL: OPGW (similar to ACSR 95/55) (24+24)		
400kV OHTL: OPGW (similar to ACSR 95/55) (24+24) accessories and fittings		
400kV OHTL: Toughened Glass Insulators (120kN, 210kN) and hardware fittings		
330kV OHTL: ACSR 'Bison' Conductor		
330kV ACSR "Bison" conductor accessories and fittings		
330kV OHTL: OPGW (48 cores)		
330kV OHTL: OPGW (48 cores) accessories and fittings		
330kV ACS 7No6 AWG (4.11/7)		
330kV ACS 7No6 AWG (4.11/7) accessories and fittings		
330kV Toughened glass insulators and hardware fittings		
132kV OHTL: ACSR 'Wolf' Conductor		
132kV OHTL: ACSR 'Wolf' conductor accessories and fittings		
132kV OHTL: OPGW (48 cores) and fittings"		
132kV OHTL: Composite Insulators (120kN) and hardware fittings		
(CCS40) copper clad steel wire strand 7No.7 AWG		
Toughened glass insulators hardware fittings		
Lattice Steel Tower Structures (by type: 400DA, 400DB, etc.; 330DA, 330DB, etc.; 132DA, 132DB, etc.)		
Foundations (by class: Class 1-6)		
Subcontractors		

Appendix 6 – Scope of Works and Supply by the Employer

The following personnel, facilities, works and supplies will be provided/supplied by the Employer, 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 Employer 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-Clause 18.2.

Unless otherwise indicated, all personnel, facilities, works and supplies will be provided free of charge to the Contractor.

S/N	Scope of Works and Supply by the Employer	Item Description	Charge to Contractor (if any)
1	Personnel	None	None
2	Facilities	Arrangement of Power Interruption	As per the safety rules and procedures of ZESCO Limited.
		The Employer shall assist the Contractor in obtaining all permits, approval and/or Licenses from all Local, State, or National Government authorities or public service undertaking in the country where sites are located.	The expenses to obtain all permits, approval, and/or service licenses mentioned shall be borne by the Contractor.
3	Works	None	None
4	Supplies	Electricity and Water: the Contractor shall be entitled to use for the purpose of the facilities such supplies of electricity and water as may be available on the site and shall provide any apparatus necessary for such use.	The Contractor shall pay the Employer at the applicable tariff plus employer's overheads, if any, for such use. Where such supplies are not available, the contractor shall make his own arrangement for provision of any supplies he may require.

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 approval or review.

The Employer, as per its requirements, will ask the contractor to submit an exhaustive list of documents before the signing of the contract for approval by the Employer.

Appendix 8 – Functional Guarantees

N/A

Performance Security Form – Bank Guarantee

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: [insert name and Address of Employer]

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 letterhead]

We have been informed that _____ (hereinafter called “the Applicant”) has entered into Contract No. _____ dated _____ with the Beneficiary, for the execution of _____ (hereinafter 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 _____ (____)², 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 therein.

This guarantee shall expire no later than the earlier of:³

- (i)

twenty-four months after our receipt of either (a) or (b) below; or
- (ii)

the ____ day of _____, 2____.⁴
- (a)

a copy of the Operational Acceptance Certificate; or
- (b)

a registered letter 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.

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.

²

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 *Employer*.

³

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 *Employer* might want to consider an extended warranty security in lieu of the extension of the Performance Security).

⁴

Insert the date twenty-eight days after the expected expiration date of the Defect Liability Period. The Employer should note that in the event of an extension of the time for completion of the Contract, the Employer 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 Employer 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 Employer’s written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.”

Advance Payment Security

Demand Guarantee

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: Name and Address of Employer

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 letterhead]

.....

We have been informed that (hereinafter called “the Applicant”) has entered into Contract No. dated with the Beneficiary, for the execution of, ... (hereinafter 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 . (.) ⁵ 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, ...⁶, 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.

⁵The 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 Employer.

⁶Insert the expected expiration date of the Time for Completion. The Employer should note that in the event of an extension of the time for completion of the Contract, the Employer 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 Employer 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’s written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.”

Forms and Procedures

Form of Completion Certificate

Date: _____
Loan/Credit N°: _____
RFB N°: _____

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 Employer 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 Employer 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 thereof: _____
- 2. Date of Completion: _____

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

This letter 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: _____
Loan/Credit N°: _____
RFB N°: _____

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 Employer 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 thereof: _____
- 2. Date of Operational Acceptance: _____

This letter 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: _____

Loan/Credit N°: _____

RFB N°: _____

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- 1. General
- 2. Change Order Log
- 3. References for Changes

ANNEXES

- Annex 1 Request for Change Proposal
- Annex 2 Estimate for Change Proposal
- Annex 3 Acceptance of Estimate
- Annex 4 Change Proposal
- Annex 5 Change Order
- Annex 6 Pending Agreement Change Order
- Annex 7 Application for Change Proposal

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 Employer.

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 Employer’s Home Office and the Site representatives of the Employer 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

(Employer's Letterhead)

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 letter _____.

1. Title of Change: _____

2. Change Request No. _____

3. Originator of Change: Employer: _____

Contractor (by Application for Change Proposal No. _____⁷):

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 request of Change:

<u>Drawing No./Document No.</u>	<u>Description</u>

7. Detailed conditions or special requirements on the requested Change: _____

8. 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 Contract or 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.

 (Employer's Name)

 (Signature)

(Name of signatory)

(Title of signatory)

Annex 2. Estimate for Change Proposal

(Contractor's Letterhead)

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: _____⁸

(a)	Engineering		(Amount)
(i)	Engineer	_____ hrs x _____ rate/hr =	_____
(ii)	Draftsperson	_____ hrs x _____ rate/hr =	_____
	Sub-total	_____ hrs	_____
	Total Engineering Cost		_____
(b)	Other Cost		_____
	Total Cost (a) + (b)		_____

 (Contractor's Name)

 (Signature)

 (Name of signatory)

 (Title of signatory)

⁸ Costs shall be in the currencies of the Contract.

Annex 3. Acceptance of Estimate

(Employer’s Letterhead)

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.

(Employer’s Name)

(Signature)

(Name and Title of signatory)

(Contractor's Letterhead)

Date: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

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

<u>Drawing/Document No.</u>	<u>Description</u>

8. Estimate of increase/decrease to the Contract Price resulting from Change Proposal:⁹

(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 _____
	Draftsperson	_____ hrs @ _____ rate/hr _____
	Total	_____ hrs _____
(h)	Extraordinary costs (computer, travel, etc.)	_____
(i)	Fee for general administration, _____ % of Items	_____

⁹ Costs shall be in the currencies of the Contract.

(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 Employer

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

(Employer's Letterhead)

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: Employer: _____
 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: _____

(Employer)

Accepted by: _____

Date: _____

(Contractor)

Annex 6. Pending Agreement Change Order

(Employer's Letterhead)

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. Employer'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:

(Employer's Name)_____
(Signature)_____
(Name of signatory)_____
(Title of signatory)

Annex 7. Application for Change Proposal

(Contractor's Letterhead)

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)