

Amendment no.1:

The changes are made in Section I: Instruction to Bidders (ITB) and Section III: Evaluation and Qualification Criteria, and Section 6.1. of Technical Specification, and are highlighted in green.



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UPPER ARUN HYDROELECTRIC LIMITED

(A Subsidiary Company of NEA)



BIDDING DOCUMENT

For

**Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola
Bazar Substation at Sankhuwasabha District**

Tender No: UAHEL/083/84/SS-01

(National Competitive Bidding)

Single-Stage: Two-Envelope Bidding Procedure

First Amendment date: August 21, 2026

Issued on: August 13, 2026

Invitation for Bids No.: UAHEL/083/84/SS-01

NCB No.: UAHEL/083/84/SS-01

Contract Identification No.: UAHEL/083/84/SS-01



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Abbreviations

BD	Bidding Document
BDF	Bidding Forms
BDS	Bid Data Sheet
BOQ	Bill of Quantities
COF	Contract Forms
DP	Development Partners
DoLI	Department of Local Infrastructure
ELI	Eligibility
EQC	Evaluation and Qualification Criteria
EXP	Experience
FIN	Financial
GCC	General Conditions of Contract
GoN ¹	Government of Nepal
ICC	International Chamber of Commerce
IFB	Invitation for Bids
ITB	Instructions to Bidders
JV	Joint Venture
LIT	Litigation
NCB	National Competitive Bidding
PAN	Permanent Account Number
PPA	Public Procurement Act
PPMO	Public Procurement Monitoring Office
PPR	Public Procurement Regulations
PL	Profit & Loss
PS	Provisional Sum
SBD	Standard Bidding Document
SCC	Special Conditions of Contract
TS	Technical Specifications
VAT	Value Added Tax
WRQ	Works Requirements

Table of Contents

Invitation for Bids.....	1
Part I: BIDDING PROCEDURES.....	4
Section I: Instructions to Bidders.....	7
Section II : Bid Data Sheet.....	41
Section III: Evaluation and Qualification Criteria.....	44
Section IV: Bidding Forms	59
Section V - Eligible Countries.....	86
Part II : EMPLOYER'S REQUIREMENT	87.
Section VI: Works Requirements.....	88
Section VII: Bill of Quantities.....	356
Part III: CONDITIONS OF CONTRACT AND CONTRACT FORMS	382
Section VIII: General Conditions of Contract.....	386
Section IX: Special Conditions of Contract.....	415
Section X: Contract Forms.....	429

Invitation for Bids

Upper Arun Hydroelectric Limited

(A Subsidiary Company of NEA)

Maharajgunj, Kathmandu

Invitation for Bids for the "**Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**".

Invitation for Bids No: UAHEL/083/84/SS-01

Date of publication: August 13, 2026

First Amendment date: August 21, 2026

1. The Upper Arun Hydroelectric Limited has allocated funds towards the cost of "**Design, Supply, Installation, Testing and Commissioning of 33/11kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**" and intends to apply part of the funds to cover eligible payments under Contracts for UAHEL/083/84/SS-01. Bidding is open to all eligible bidder as per section V of Bidding Document.
2. **Upper Arun Hydroelectric Limited** invites electronic bids from eligible bidders for **Design, Supply, Installation, Testing and Commissioning of 33/11kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District** under National Competitive Bidding – Single Stage Two Envelope Bidding procedures.
Only eligible bidders with the following key qualifications should participate in this bidding:
 - Minimum Average Annual Construction Turnover of the best 3 years within the last 10 years: **NRs 232,594,000.00.**
 - Minimum Work experience of similar size and nature: **NRs 93,038,000.00**
 - The similarity here shall mean Design, Supply, Delivery and Installation, Testing, Commissioning of 33/11kV or higher Voltage Substation.
3. Bidder who chooses to submit their bid electronically, Bidders are required to submit two separate bid response documents, one containing (i) the Technical Bid and the other (ii) the Price Bid, both in turn enclosed in one sealed envelope as per the provision of ITB 21 of the Bidding Document.
4. Eligible Bidders may obtain further information and inspect the Bidding Documents at the office Upper Arun Hydroelectric Limited, Shanti Priya Marg, Maharajgunj, Phone No: +977-1-4720543, +977-1-4720553, Email: uahepnea@gmail.com, upperarun@nea.org.np or may visit PPMO e-GP system www.bolpatra.gov.np/egp
5. Bidders who choose to submit their bid electronically may download the bidding documents for e-submission from PPMO's e-GP system www.bolpatra.gov.np/egp at no cost.
6. Pre-bid meeting shall be held at *the address mentioned below* at **14:00 Hrs. on August 25, 2026.**
7. Electronic bids must be submitted, through PPMO's e-GP system www.bolpatra.gov.np/egp on or before **12:00 PM on September 04, 2026.**
8. The bids will be opened in the presence of Bidders' representatives who choose to attend at **14:00Hrs. on September 04, 2026** at the office of Upper Arun Hydroelectric Limited, Maharajgunj, Kathmandu. Bids must be valid for a period of **120 days** after bid opening and must be accompanied by a scanned copy of the bid security in pdf format. The Bidder shall furnish a bid security; from Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law with a minimum of **NRs. 3,911,000.00** which shall be valid for 30 days beyond the validity period of the bid **i.e. 150 Days**. The bid security shall be in the form of an unconditional on-demand guarantee.

Detailed qualification criteria of the bidder, Manufacturers and construction period are more elaborately described in the bidding documents.

The Contract duration is **12 months** from the date of Contract Effectiveness.

9. If the last date of submission and opening falls on a government holiday, then the next working day shall be considered as the last date. In such case the validity period of the bid security shall remain the same as specified for the original last date of bid submission.



MVA Gola Bazar Substation at Sankhuwasabha District

Invitation for bids no.	Procurement Description	Bid Security	Bid Validity Period	Last date and Time of submission	Date of Opening of Bid
UAHEL/083/84/SS-01	Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District	NRs. 3,911,000.00	120 days	12 noon on September 04, 2026	14:00 Hrs. on September 04, 2026

Address

Upper Arun Hydroelectric Limited

Shanti Priya Marg, Maharajgunj

44600, Kathmandu, Nepal

Tel: +977-1-4720543, +977-1-4720553

Email: uahepnea@gmail.com, upperarun@nea.org.np



Part I: BIDDING PROCEDURES



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Table of Contents

A. General	9
1. Scope of Bid	9
2. Source of Funds.....	9
3. Fraud and Corruption	9
4. Eligible Bidders	12
5. Eligible Materials, Equipment and Services.....	13
B. Contents of Bidding Documents	14
6. Sections of Bidding Document.....	14
7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting.....	14
8. Amendment of Bidding Document	15
9. Cost of Bidding	15
10. Language of Bid	16
11. Documents Comprising the Bid	16
12. Letter of Bid and Schedules	17
13. Alternative Bids.....	17
14. Bid Prices and Discounts.....	17
15. Currency of Bid and Payment	18
16. Documents Comprising the Technical Proposal	18
17. Documents Establishing the Qualifications of the Bidder.....	18
18. Period of Validity of Bids.....	18
19. Bid Security.....	18
20. Format and Signing of Bid	20
D. Submission and Opening of Bids	20
21. Sealing and Marking of Bids	20
22. Deadline for Submission of Bids	23
23. Late Bids	23
24. Withdrawal, and Modification of Bids.....	23
25. Bid Opening	25
E. Evaluation and Comparison of Bids	26
26. Confidentiality	26
27. Clarification of Bids.....	27
28. Deviations, Reservations, and Omissions	27
29. Examination of Technical Bid.....	27

Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

30. Determination of Responsiveness of Technical Bid.....	27
31. NonconformitiesErrors, andOmissions	28
32 Qualification of the Bidder	29
33. Correction of Arithmetical Errors.....	29
34 Subcontractors	29
35. Evaluation of Price Bids.....	30
36. Comparison of Bids.....	31
37. Employer's Right to Accept Any Bid, and to Reject Any or All Bids	31
38. Award Criteria.....	31
39. Letter of Intent to Award the Contract/Notification of Award.....	31
40. Performance Security and Line of Credit	32
41 Signing of Contract	32
42. Complaint and Review	33



Section I: Instructions to Bidders

A. General	
1. Scope of Bid	1.1 In connection with the Invitation for Bids indicated in the Bid Data Sheet (BDS), the Employer, as indicated in the BDS, issues this Bidding Document for the procurement of Works as specified in Section VI (Works Requirements). The name, identification, and number of lots (contracts) / multiple contracts of the National Competitive Bidding (NCB) are provided in the BDS. 1.2 Throughout this Bidding Document: (a) the term “in writing” means communicated in written form and delivered against receipt through e-GP system or email or fax or courier; (b) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and (c) “day” means calendar day.
2. Source of Funds	2.1 GoN Funded: In accordance with its annual program and budget, approved by the GoN, the implementing agency indicated in the BDS plans to apply a portion of the allocated budget to eligible payments under the contract(s) for which this Bidding Document is issued. Or Public Entities' own Resource Funded: In accordance with its annual program and budget, approved by the public entity, the implementing agency indicated in the BDS plans to apply a portion of the allocated budget to eligible payments under the contract(s) for which this Bidding Document is issued. Or DP Funded: The GoN has applied for or received financing (hereinafter called “funds”) from the Development Partner (hereinafter called “the DP”) indicated in the BDS toward the cost of the project named in the BDS. The GoN intends to apply a portion of the funds to eligible payments under the contract(s) for which this Bidding Document is issued. 2.2 DP Funded: Payment by the DP will be made only at the request of the GoN and upon approval by the DP in accordance with the terms and conditions of the financing agreement between the GoN and the DP (hereinafter called the “Loan/Grant Agreement”), and will be subject in all respects to the terms and conditions of that Loan/Grant Agreement. No party other than the GoN shall derive any rights from the Loan Agreement or have any claim to the funds.
3. Fraud and Corruption	3.1 Procuring Entities as well as Bidders, suppliers and contractors and their sub-contractors shall adhere to the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this; (a) the Employer adopts, for the purposes of this provision, the terms as defined below: (i) “corrupt practice” means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party; (ii) “fraudulent practice” means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

- (iii) “coercive practice” means 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;
 - (iv) “collusive practice” means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.
 - v) “obstructive practice” means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an investigation; (b) making false statements to investigators in order to materially impede an investigation; (c) failing to comply with requests to provide information, documents, or records in connection with an investigation; (d) 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 (e) materially impeding GoN/DP’s contractual rights of audit or access to information; and
 - vi) “integrity violation” is any act which violates Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of GoN/DP sanctions, retaliation against whistleblowers or witnesses, and other violations of Anticorruption Policy, including failure to adhere to the highest ethical standard.
- (b) the Employer will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the contract;
 - (c) DP will cancel the portion of the financing allocated to a contract if it determines at any time that representative(s) of the GoN/or of a beneficiary of DP-financing engaged in corrupt, fraudulent, collusive, or coercive practices or other integrity violations during the procurement or the execution of that contract, without the GoN having taken timely and appropriate action satisfactory to DP to remedy the situation.
 - d) DP will impose remedial actions on a firm or an individual, at any time, in accordance with DP's Anticorruption Policy and related Guidelines (as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate in DP-financed, -administered, or -supported activities or to benefit from an DP-financed, -administered, or -supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations; and
 - (e) The Contractor shall permit the GoN/DP to inspect the Contractor’s accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the GoN /DP, if so, required by the GoN/DP.

- 3.2 The Bidder shall not carry out or cause to carry out the following acts with an intention to influence the implementation of the procurement process or the procurement agreement:
- (a) give or propose improper inducement directly or indirectly,
 - (b) distortion or misrepresentation of facts,
 - (c) engaging in corrupt or fraudulent practice or involving in such act,
 - (d) interference in participation of other competing bidders,
 - (e) coercion or threatening directly or indirectly to cause harm to the person or the property of any person to be involved in the procurement proceedings,
 - (f) collusive practice among bidders before or after submission of bids for distribution of works among bidders or fixing artificial/uncompetitive bid price with an intention to deprive the Employer the benefit of open competitive bid price,

**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	(g) Contacting the Employer with an intention to influence the Employer with regards to the bids or interference of any kind in examination and evaluation of the bids during the period from the time of opening of the bids until the notification of award of contract. 3.3 PPMO, on the recommendation of the Procuring Entity may blacklist a Bidder for a period of one (1) to three (3) years for its conduct including on the following grounds and seriousness of the act committed by the bidder: (a) if convicted by a court of law in a criminal offence which disqualifies the Bidder from participating in the contract, (b) if it is established that the contract agreement signed by the Bidder was based on false or misrepresentation of Bidder's qualification information, (c) if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for, or in executing, a GoN/DP-financed contract. (d) if the Successful Bidder fails to sign the Contract. (e) if the bidder fails to inform about the saturation of the maximum number of contracts as per ITB 4.10. (f) a Bidder requests for withdrawal or modification of its bid: (i) after the Bid Submission deadline and during the period of validity specified by the Bidder on the Letter of Technical Bid and Price Bid, in case of electronic submission; (ii) from the period twenty-four hours prior to bid submission deadline up to the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid, in case of hard copy submission. (g) if the bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification as per ITB 27.1. (h) a Bidder changes the prices or substance of the bid while providing information pursuant to ITB 27.1. 3.4 A bidder declared blacklisted and ineligible by the GoN, Public Procurement Monitoring Office (PPMO), by a competent authority under the prevailing law for failure to repay a loan disbursed by a bank or financial institution, and/or the DP in case of DP funded project, shall be ineligible to bid for a contract during the period of time determined by the GoN, PPMO, the competent authority, and/or the DP. 3.5 In case of a natural person or firm/institution/company which is already declared blacklisted and ineligible by the GoN, any other new or existing firm/institution/company owned partially or fully by such Natural person or Owner or Board of director of blacklisted firm/institution/company; shall not be eligible bidder. 3.6 Furthermore, Bidders shall be aware of the provisions of GCC 28.3 and GCC 72.3(j).
4. Eligible Bidders	4.1 A Bidder may be a natural person, private entity, or government owned entity subject to ITB 4.5 or any combination of them in the form of a Joint Venture (JV) under an existing agreement, or with the intent to constitute a legally-enforceable joint venture. In the case of a JV: (a) all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms. Maximum number of JV shall be as specified in the BDS and (b) the JV shall nominate a 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. 4.2 A Bidder, and all parties constituting the Bidder, shall have the nationality of an eligible country, in accordance with Section V (Eligible Countries). A Bidder shall be deemed



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**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	to have the nationality of a country if the Bidder is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed sub-contractors or suppliers for any part of the Contract including related services.
	4.3 A Bidder shall not have a conflict of interest. A Bidder found to have a conflict of interest shall be disqualified. A Bidder may be considered to be in a conflict of interest with one or more parties in this bidding process, if any of, including but not limited to, the following apply: (a) they have controlling shareholders in common; or (b) they receive or have received any direct or indirect subsidy from any of them; or (c) they have the same legal representative for purposes of this bid; or (d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to material information about or improperly influence the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or (e) a Bidder participates in more than one bid in this bidding process either individually or as a partner in a joint venture. This will result in the disqualification of all Bids in which it is involved. However, subject to any finding of a conflict of interest in terms of ITB 4.3 (a)-(d) above, this does not limit the participation of the same subcontractor in more than one bid; or (f) a Bidder or any of its affiliated entity, participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the Bid; or (g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer as Engineer for the Contract. (h) a Bidder that has a close business or family relationship with a professional staff of the Procuring Entity.
	4.4 A firm that is under a declaration of ineligibility by the GoN in accordance with ITB 3, at the date of the deadline for bid submission or thereafter, shall be disqualified. A firm shall not be eligible to participate in any procurement activities under an DP-financed, -administered, or -supported project while under temporary suspension or debarment by DP pursuant to the DP's Anticorruption Policy (see ITB 3), whether such debarment was directly imposed by the DP, or enforced by other DPs pursuant to the Agreement for Mutual Enforcement of Debarment Decisions. A bid from a temporary suspended or debarred firm will be rejected.
	4.5 Enterprises owned by Government shall be eligible only if they can establish that they are legally and financially autonomous and operate under commercial law, and that they are not a dependent agency of the GoN.
	4.6 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.
	4.7 Firms shall be excluded in any of the cases, if (a) 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, Nepal prohibits any import of goods or contracting of works or services from that country or any payments to persons or entities in that country. Where Nepal prohibits payments to



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**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	a particular firm or for particular goods by such an act of compliance, that firm may be excluded; (b) DP Funded: as a matter of law or official regulation, Nepal prohibits commercial relations with that country, provided that the DP is satisfied that such exclusion does not preclude effective competition for the supply of goods or related services required; (c) DP Funded: a firm sanctioned or temporarily suspended by the DP in relation to their guidelines or appropriate provisions on preventing and combating fraud and corruption in projects financed by them. 4.8 In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders. 4.9 The Bidder, including all parties constituting the Bidder, shall be ineligible to participate in the open competitive bidding process if it has already secured maximum number of construction contracts (in open competitive bidding) as specified in BDS and has not yet completed the work as stipulated in the respective contracts 4.10 For the purpose of ITB 4.9 above, the bidder shall declare that the bidder, and all parties constituting the Bidder have not already secured maximum number of construction contract (in open competitive bidding) as specified in BDS. If the bidder, and all parties constituting the Bidder has participated in bidding processes of many public entities and during that period the maximum number of contracts have been attained as specified saturates due to issuance of letters of acceptance by a particular public entity, the bidder shall inform in writing to all other concerned public entities, where the bidder have participated in bidding process, within three days of issuance of last letter of acceptance that saturates the maximum number of contracts as specified.										
5. Eligible Materials, Equipment and Services	5.1 The materials, equipment and services to be supplied under the Contract shall have their origin in any source countries as defined in accordance with Section V (Eligible Countries) and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment and services. 5.2 For purposes of ITB 5.1 above, "origin" means the place where the materials and equipment are mined, grown, produced or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.										
B. Contents of Bidding Documents											
6. Sections of Bidding Document	6.1 The Bidding Document consist of Parts I, II, and III, which include all the Sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB 8. PART I Bidding Procedures <table border="0"> <tr> <td>Section I</td><td>Instructions to Bidders (ITB)</td></tr> <tr> <td>Section II</td><td>Bid Data Sheet (BDS)</td></tr> <tr> <td>Section III</td><td>Evaluation and Qualification Criteria (EQC)</td></tr> <tr> <td>Section IV</td><td>Bidding Forms (BDF)</td></tr> <tr> <td>Section V</td><td>Eligible Countries</td></tr> </table> PART II Requirements	Section I	Instructions to Bidders (ITB)	Section II	Bid Data Sheet (BDS)	Section III	Evaluation and Qualification Criteria (EQC)	Section IV	Bidding Forms (BDF)	Section V	Eligible Countries
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**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	Section VI Works Requirements (WRQ) Section VII Bill of Quantities (BOQ) PART III Conditions of Contract and Contract Forms Section VIII General Conditions of Contract (GCC) Section IX Special Conditions of Contract (SCC) Section X Contract Forms (COF)
	6.2 The Invitation for Bids (IFB) issued by the Employer is not part of the Bidding Document.
	6.3 The Employer is not responsible for the completeness of the Bidding Document and their Addenda, if they were not obtained directly from the source stated by the Employer in the Invitation for Bids.
	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 and documentation as is required by the Bidding Documents. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.
7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting	7.1 A prospective Bidder requiring any clarification of the Bidding Document shall contact the Employer in writing at the Employer's address indicated in BDS or raise any question or curiosity 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 within the period as mentioned in ITB 7.5. 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. Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 8 and ITB 22.2.
	7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself, on its own risk and responsibility, all information that may be necessary for preparing the bid and entering into a Contract for construction of the Works. 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 The Bidder's designated representative is invited to attend a pre-bid meeting, if provided for in the BDS . 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 as mentioned in BDS .
	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. 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



**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	minutes of the pre-bid meeting.
	7.7 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 addendum or several 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.
	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 22.2. However, the time available to submit bids shall not be less than five (5) days since amendment in bidding document.
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 in no case 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 envelopes submitted simultaneously, one called the Technical Bid containing the documents listed in ITB 11.2 and the other the Price Bid containing the documents listed in ITB 11.3, both envelopes enclosed together in an outer single envelope. 11.2 The Technical Bid shall comprise the following: (a) Letter of Technical Bid; (b) Bid Security in accordance with ITB 19; (c) alternative Technical Bid, at Bidder's option and if permissible, in accordance with ITB 13; (d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2; (e) documentary evidence in accordance with ITB 17, establishing the Bidder's qualifications to perform the contract; (f) Technical Proposal in accordance with ITB 16; (g) Bids submitted by a Joint Venture shall include a copy of the Joint Venture Agreement entered into by all partners. Alternatively, a Letter of Intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all partners and submitted with the Bid, together with a copy of the proposed agreement. The Joint Venture agreement, or letter of intent to enter



**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	into a Joint Venture including a draft agreement shall indicate at least the parts of the Works to be executed by the respective partners; (h) list of subcontractors, in accordance with ITB 34 (If any); and (i) Any other documents required in the BDS. 11.3 The Price Bid shall comprise the following: (a) Letter of Price Bid; (b) completed Bill of Quantities (BoQ), in accordance with ITB 12 and ITB 14, or as stipulated in the BDS; (c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13; (d) Table of Price adjustment (if applicable) ; and (e) Any other document required in the BDS. 11.4 The Bidder is solely responsible for the authenticity of the submitted documents. 11.5 The Technical Bid shall not include any financial information related to the Price Bid. A Technical Bid containing such material financial information shall be declared non-responsive.
12. Letter of Bid and Schedules	12.1 The Letters of Technical Bid and Price Bid, Schedules, and all documents listed under ITB 11, shall be prepared using the relevant forms in Section IV (Bidding Forms) and in Section VII (Bill of Quantities). The forms must be completed without any alterations to the text, and no substitutes shall be accepted. 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 alternative times for completion are explicitly invited, a statement to that effect will be included in the BDS, as will the method of evaluating different times for completion. 13.3 When specified in the BDS pursuant to ITB 13.1, and subject to ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Document must first price the Employer's design as described in the Bidding Document and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the evaluated Bidder whose Bid Price is closest to the Average Bid Price conforming to the basic technical requirements shall be considered by the Employer. 13.4 When specified in the BDS, Bidders are permitted to submit alternative technical solutions for specified parts of the Works. Such parts will be identified in the BDS and described in Section VI (Works Requirements). The method for their evaluation will be stipulated in Section III (Evaluation and Qualification Criteria).
14. Bid Prices and Discounts	14.1 The prices and discounts quoted by the Bidder in the Letter of Price Bid and in the Schedules shall conform to the requirements specified below. 14.2 The Bidder shall submit a bid for the whole of the works described in ITB 1.1 by filling in prices for all items of the Works, as identified in Section VII (Bill of Quantities). In case of Unit Rate Contracts, the Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered



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Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	by the Bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities. 14.3 The price to be quoted in the Letter of Price Bid shall be the total price of the Bid, excluding any discounts offered. Absence of the total price in the Letter of Price Bid may result in rejection of the Bid. 14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Price Bid, in accordance with ITB 12.1. 14.5 If so indicated in ITB 1.1 and ITB 35.4, bids are invited for individual Contracts or for any combination of Contracts (packages). Bidders wishing to offer any price reduction for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Price reductions or discounts shall be submitted in accordance with ITB 14.4, provided the Bids for all Contracts are submitted and opened at the same time. 14.6 Unless otherwise provided in the BDS and the Conditions of Contract, the prices quoted by the Bidder shall be fixed. If the prices quoted by the Bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract, the Bidder shall furnish the indices and weightings for the price adjustment formulae in the Table of Adjustment Data in Section IV (Bidding Forms) and the Employer may require the Bidder to justify its proposed indices and weightings. 14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 30 days prior to the deadline for submission of bids, shall be included in the rates and prices and the total bid price submitted by the Bidder.
15. Currency of Bid and Payment	15.1 The currency of the bid and payment shall be in Nepalese Rupees.
16. Documents Comprising the Technical Proposal	16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.
17. Documents Establishing the Qualifications of the Bidder	17.1 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).
18. Period of Validity of Bids	18.1 Bids shall remain valid for the period specified in the BDS. The bid validity period shall start from the bid submission deadline as prescribed by the Employer in accordance with ITB 22.1. If the prescribed bid submission deadline date falls on a government holiday, then the next working day shall be considered as the bid submission deadline date. In such case the validity period of the bids shall be considered from the original bid submission deadline date. In the case of electronic bid submission, if any technical issue arises in the handling of



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Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	the e-GP system, the PPMO may extend the deadline for bid submission. However, the validity period of the bids shall still be counted from the original bid submission deadline. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive. 18.2 In exceptional circumstances, prior to the expiration of the bid validity period, 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 19, it shall also be extended 30 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 and to include any additional conditions against the provisions specified in Bid Documents.
19. Bid Security	19.1 The Bidder shall furnish as part of its bid, in original form, a bid security as specified in the BDS. In case of e-submission of bid, the Bidder shall upload scanned copy of Bid security letter at the time of electronic submission of the bid. The Bidder accepts that the scanned copy of the Bid security shall, for all purposes, be equal to the original. The details of original Bid Security and the scanned copy submitted with e-bid should be the same otherwise the bid shall be non-responsive. 19.2 The bid security shall be, at the Bidder's option, in any of the following forms: (a) an unconditional bank guarantee from Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law or; (b) a cash deposit voucher in the Employer's Account as specified in BDS. 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 Form acceptable to the employer. The form must include the complete name of the Bidder. The bid security shall be valid for minimum thirty (30) days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2. A bid security valid for a shorter period shall be rejected by the Employer as nonresponsive. 19.3 The bid security issued by any foreign Bank outside Nepal must be counter guaranteed by Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law in Nepal. 19.4 Any bid not accompanied by an enforceable and substantially compliant bid security shall be rejected by the Employer as nonresponsive. In case of e- Submission, if the scanned copy of an acceptable Bid Security letter is not uploaded with the electronic Bid then Bid shall be rejected. 19.5 The public entity shall return the bid securities except those that are to be forfeited as per ITB 19.6 to the respective bidders within three (3) days after the successful bidder has furnished the required performance security and signed the Contract Agreement pursuant, to ITB 40.1 and ITB 41.1. 19.6 The bid security shall be forfeited if: GoN funded: (a) a Bidder requests for withdrawal or modification of its bid, except as provided in ITB 18.2: (i) during the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid, in case of electronic submission; (ii) from the period twenty-four hours prior to bid submission deadline up to the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid,



**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	in case of hard copy submission. (b) a Bidder changes the prices or substance of the bid while providing information pursuant to clause 27.1; (c) a Bidder involves in fraud and corruption pursuant to clause 3.1; (d) the successful Bidder fails to: (i) furnish a performance security in accordance with ITB 35.5, ITB 35.8 and ITB 40.1; or (ii) sign the Contract in accordance with ITB 41.1; or (iii) accept the correction of arithmetical errors pursuant to clause 33.1; (e) if the bidder fails to inform about the saturation of the maximum number of contracts as per ITB 4.10. DP funded: The bid security shall be forfeited (a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid, except as provided in ITB 18.2; or (b) if the successful Bidder fails to (i) furnish a performance security in accordance with ITB 35.5 and ITB 40.1; or (ii) sign the Contract in accordance with ITB 41.1; or (iii) accept arithmetical corrections in accordance with ITB 33.1. 19.7 The Bid Security of a Joint Venture shall be in the name of the Joint Venture that submits the bid. If the Joint Venture has not been legally constituted at the time of bidding, the Bid Security shall be in the names of all future partners as named in the letter of intent mentioned in ITB 4.1.
20. Format and Signing of Bid	20.1 The Bidder shall prepare one original set of the Technical Bid and one original of the Price Bid comprising the Bid as described in ITB 11 and clearly mark it “ORIGINAL – TECHNICAL BID” and “ORIGINAL – PRICE BID.” Alternative bids, if permitted in accordance with ITB 13, shall be clearly marked “ALTERNATIVE”. In addition, the Bidder shall submit copies of the bid in the number specified in the BDS, and clearly mark each of them “COPY.” In the event of any discrepancy between the original and the copies, the original shall prevail. In case of e-submission of bid, the Bidder shall submit his bid electronically in PDF or web forms files as specified in ITB Clause 21.1(b). 20.2 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, except for un amended printed literature, shall be signed or initialed by the person signing the bid. 20.3 Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the bid.
D. Submission and Opening of Bids	
21. Sealing	21.1 Unless otherwise specified in BDS, Bidders shall submit their bids by electronic or by



Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

and Marking of Bids

mail/by hand/by courier. Procedures for submission, sealing and marking are as follows:

(a) Bidders submitting bids by mail, by hand or by courier

shall enclose the original of the Technical Bid, and the original of the Price Bid and each copy of the Technical Bid and Price Bid, including alternative bids, if permitted in accordance with ITB 13, in separate sealed envelopes, duly marking the envelopes as **“ORIGINAL TECHNICAL BID”, “ORIGINAL – PRICE BID”, “ALTERNATIVE” and “COPY No. – TECHNICAL BID” and “COPY NO. PRICE BID”** These envelopes containing the original and the copies shall then be enclosed in one single envelope.

(b) Bidders submitting Bids electronically shall follow the electronic bid submission procedure specified in this clause.

- i. The bidder is required to register in the e-GP system <https://www.bolpatra.gov.np/egp> following the procedure specified in e-GP guideline.
- ii. Interested bidders may either purchase the bidding document from the Employer's office as specified in the Invitation for Bid (IFB) or bidders may download the IFB and bidding document from e-GP system.
- iii. The registered bidders need to maintain their profile data required during preparation of bids.
- iv. The bidder can prepare their technical and price bids using data and documents maintained in bidder's profile and forms/format provided in bidding document by Employer. The bidder may submit bids as a single entity or as a joint venture. The bidder submitting bid in joint venture shall have to upload joint venture agreement along with partner(s) Bolpatra ID provided during bidder's registration.
- v. Bidders (all partners in case of JV) should update their profile data and documents required during preparation and submission of their technical bids.
- vi. In case of bid submission in JV, the consent of the partners shall be obtained through the confirmation link sent to the registered email address and the partners shall have to acknowledge their confirmation.

The required forms and documents shall be part of technical bids.

No.	Document	Requirement	Remarks
1.	Letter of Technical Bid	Mandatory	PDF
2.	Bid Security / Bank Guarantee	Mandatory	PDF
3.	Firm or Company registration Certificate	Mandatory	PDF
4.	VAT and PAN registration Certificate	Mandatory (for domestic bidders only)	PDF
5.	Business Registration Licence	Mandatory	PDF
6.	Tax Clearance Certificate/Tax return submission evidence/evidence of time extension	Mandatory (for domestic bidders only)	PDF
7.	Power of Attorney of Bid signatory	Mandatory	PDF
8.	Joint venture agreement	Mandatory in case of	PDF



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**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

		JV Bids Only	
9.	Qualification Documents	Mandatory	Using profile data(financial details, contract details etc.) and Technical Proposal
10.	Additional documents] specified in ITB 11.2 (i)	Mandatory (If any)	PDF

The required forms and documents shall be part of price bids.

No.	Document	Requirement	Remarks
1.	Letter of Price Bid	Mandatory	PDF
2.	Completed Bill of Quantities (BoQ)	Mandatory	Online Forms
3.	Price Adjustment Table	Mandatory (If applicable)	Online Forms
4.	Additional Documents specified in ITB 11.3 (e)	Mandatory (If any)	PDF

Note:

- a) The documents specified as “Mandatory” should be included in e-submission and non-submission of the documents shall be considered as non-responsive bid.
b) Bidders (all partners in case of JV) should verify/update their profile documents as appropriate for the specific bid before submitting their bid electronically.

- vii. After providing all the details and documents, two separate bid response documents i.e technical bids and price bids will be generated from the system. Bidders are advised to download and verify the response documents prior to bid submission.
- viii. For verifying the authentic user, the system will send one time password (OTP) in the registered e-mail address of the bidder. System will validate the OTP and allow bidder to submit their bid.
- ix. Electronically submitted bids can be modified and/or withdrawn through system. The bidder may modify their bids multiple times online within bid submission date and time specified in e-GP system. Once a Bid is withdrawn, bidder won't be able to submit another bid response for the same bid.
- x. The Bidder / Bid shall meet the following requirements and conditions for e-submission of bids;
- aa) The e-submitted bids must be readable through PDF reader.
- bb) The facility for submission of bid electronically through e-submission is to promote transparency, non-discrimination, equality of access, and open competition in the bidding process. The Bidders are fully responsible to use the e- submission facility properly in e-GP system as per specified procedures and in no case the Employer shall be held liable for Bidder's inability to use this facility.
- cc) When a bidder submits electronic bid through the PPMO e-GP portal, it is assumed that the bidder has prepared the bid by studying and examining the complete set of the Bidding documents including specifications, drawings and conditions of contract.

21.2. The inner and outer envelopes shall:

- (aa) bear the name and address of the Bidder;
(bb) be addressed to the Employer as provided in BDS 22.1;
(cc) bear the specific identification of this bidding process indicated in BDS 1.1;



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Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	and 21.3 The outer envelope and the inner envelope containing Technical Proposal shall bear a warning not to open before the time and date for the opening of Technical Bid in accordance with ITB 25.1. 21.4 The inner envelope containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with ITB 25.7 21.5 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.
22. Deadline for Submission of Bids	22.1 Bids must be received by the Employer at the address and no later than the date and time indicated in the BDS. In case of e-submission, the standard time for e-submission is Nepal Standard Time as set out in the server. The e-procurement system will accept the e-submission of bid from the date of publishing of notice and will automatically not allow the e-submission of bid after the deadline for submission of bid. 22.2 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.
23. Late Bids	23.1 The Employer shall not consider any bid that arrives after the deadline for submission of bids, in accordance with ITB 22. Any bid received by the Employer after the deadline for submission of bids shall be declared late, rejected, and returned unopened to the Bidder.
24. Withdrawal, and Modification of Bids	24.1 A Bidder may withdraw, or modify its bid- Technical or Price - after it has been submitted either in hard copy or by e-submission. Once a Bid is withdrawn, bidder shall not be able to submit another bid for this bidding process. Procedures for withdrawal or modification of submitted bids are as follows: (i) Bids submitted in Hard Copy GoN Funded: a) Bidders may withdraw or modify its bids by sending a written notice in a sealed envelope, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2. The corresponding modification of the bid must accompany the respective written notice. All notices must be: (aa) prepared and submitted in accordance with ITB 20 and ITB 21, and in addition, the respective envelopes shall be clearly marked “WITHDRAWAL”, “MODIFICATION;” and (bb) received by the Employer twenty; four hours prior to the deadline prescribed for submission of bids, in accordance with ITB 22. DP Funded: A Bidder may withdraw or modify its Bid – Technical or Price – 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 20.2, (except that withdrawal notices do not require copies). The corresponding modification of the Bid must accompany the respective written notice. All notices must be (a) prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawal notices do not require copies), and in addition, the respective envelopes shall be clearly marked “WITHDRAWAL,” and “MODIFICATION;” and (b) received by the Employer prior to the deadline prescribed for submission of Bids, in accordance with ITB 22.



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	ii) E-submitted bids. a) Bidder may submit modification or withdrawal prior to the deadline prescribed for submission of bids through e-GP system by using the forms and instructions provided by the system. 24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall not be opened. In case of hard copy submission, the Bid will be returned unopened to the Bidders. 24.3 The following provisions apply for withdrawal or modification of the Bids: GoN Funded: (i) In case of bids submitted in hard copy no bid shall be withdrawn or modified in the interval between 24 hours prior to the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Bid or any extension thereof. (ii) In case of e-submitted bids no bids shall be withdrawn or modified in the interval between deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid or any extension thereof. DP Funded: No Bid may be withdrawn or modified in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid or any extension thereof. 24.4 Except in case of any modification or correction in bid document made by procuring entity, Bidder may submit request for withdrawal or modification only one time. 24.5 In case of hard copy bid, no bid may be withdrawn if the bid has already been modified; except in case of any modification or correction in bid document by procuring entity. 24.6 Request for withdrawal or modification must be made through the same medium of submission. Request for withdrawal or modifications through different medium shall not be considered.
25. Bid Opening	25.1 The Employer shall open the Technical Bids in public at the address, on the date and time specified in the BDS in the presence of Bidders' designated representatives who choose to attend. The Price Bids will remain unopened and will be held in custody of the Employer until the specified time of their opening. If the Technical Bid and Price Bid are submitted together in one envelope, the Employer shall reject the Bid as nonresponsive. 25.2 The Employer shall download the e-submitted Technical Bid. The e-GP system allows the Employer to download the e-submitted technical bid only after bid opening date and time after login simultaneously by at least two members of the Bid Opening Committee. 25.3 Electronically submitted Technical Bid shall be opened at first in the same time and date as specified above. Electronic Bids shall be opened one by one and read out. The e-submitted technical bids must be readable through open standards interfaces. Unreadable and or partially submitted bid files shall be considered incomplete. 25.4 Thereafter, envelopes marked "WITHDRAWAL" shall be opened and read out and the



Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	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. Next, envelopes marked "MODIFICATION" shall be opened and read out with the corresponding bid. No Technical Bid and/or Price Bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at bid opening. Only the Technical Bid, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original and Modification, will remain unopened in accordance with ITB 25.1.
	25.5 All other envelopes holding the Technical Bid shall be opened one at a time, reading out: the name of the Bidder; whether there is a modification; the presence of a bid security and any other details as the Employer may consider appropriate. Only Technical Bids read out and recorded at bid opening shall be considered for evaluation. No bid shall be rejected at opening of Technical Bids except for late bids, in accordance with ITB 23.1.
	25.6 The Employer shall prepare a record of the opening of Technical Bids that shall include, as a minimum: the name of the Bidder and whether there is a withdrawal, or modification; and the presence or absence of a bid security. 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.
	25.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given at least 7 days' notice for the opening of Price Bids.
	25.8 The Employer will notify Bidders in writing who have been rejected on the grounds of their Technical Bids being substantially nonresponsive to the requirements of the Bidding Document and return their Price Bids unopened.
	25.9 The Employer shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Technical Bids, in the presence of Bidders' representatives who choose to attend at the address, on the date, and time specified by the Employer. The Bidder's representatives who are present shall be requested to sign a register evidencing their attendance.
	25.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded: (a) the name of the Bidder; (b) whether there is a modification; (c) the Bid Prices, including any discounts and alternative offers; and (d) any other details as the Employer may consider appropriate. Only Price Bids, discounts, modifications, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. No Bid shall be rejected at the opening of Price Bids.
	25.11 The Employer shall prepare a record of the opening of Price Bids that shall include, as a minimum, the name of the Bidder, the Bid Price (per lot if applicable), any



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Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	discounts, modifications and alternative offers. 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.
E. Evaluation and Comparison of Bids	
26. Confidentiality	26.1 Information relating to the examination, evaluation, comparison, and post-qualification of bids and recommendation of Contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all Bidders.
	26.2 Any attempt 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.
	26.3 Notwithstanding ITB 26.2, 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 may do so in writing.
27. Clarification of Bids	27.1 To assist in the examination, evaluation, and comparison of the Technical and Price Bids, 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 substance of the Technical Bid or prices in the Price Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Price Bids, in accordance with ITB 33. In case of e-submission of bid, upon notification from the employer, the bidder shall also submit the original of documents comprising the Technical and Price Bid as per ITB 11.2 and ITB 11.3 for verification of submitted documents for acceptance of the e-submitted bid.
	27.2 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 shall be rejected.
28. Deviations, Reservations, and Omissions	28.1 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. Examination of Technical Bid	29.1 The Employer shall examine the Technical Bid to confirm that all documents and technical documentation requested in ITB 11.2 have been submitted. If any of these documents or information (except alternative Technical Bid which is optional) is missing, the bid shall be rejected.
	29.2 In case of e-submission bids, the Employer shall confirm that all the documents and information requested in ITB 21.1 have been submitted. If any of these documents or information is missing, the bid shall be rejected.
30. Determination of	30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the bid itself, as defined in ITB 11.2.
	30.2 A substantially responsive Technical Bid is one that meets the requirements of the Bidding



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**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

Responsiveness of Technical Bid	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 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 16, Technical Proposal, in particular, to confirm that all requirements of Section VI (Works Requirements) have been met without any material deviation, reservation or omission. 30.4 If a bid 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. 30.5 In case of e-submission bids, the Employer evaluates the bid on the basis of the information in the electronically submitted bid files. If the Bidder cannot substantiate or provide evidence to establish the information provided in e-submitted bid through documents/ clarifications as per ITB Clause 27.1, the bid shall not be considered for further evaluation.
	30.6 In Case, a corruption case is being filed to Court against the Natural Person or Board of Director of the firm/institution /company or any partner of JV, such Natural Person or Board of Director of the firm/institution /company or any partner of JV such bidder's bid shall be excluded from the evaluation, if public entity receives instruction from Government of Nepal. 30.7 Except in case of e-submission, the Price Bid of the bidder, which is evaluated as substantially non-responsive in technical bid, shall be returned to the respective bidders.
31. Non-conformities Errors, and Omissions	31.1 Provided that a bid is substantially responsive, the Employer may waive any non-conformities in the bid that do not constitute a material deviation, reservation, or omission. 31.2 Provided that a Technical 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 Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the Price Bid. Failure of the Bidder to comply with the request may result in the rejection of its bid. 31.3 Provided that a Technical 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. The adjustment shall be made using the



Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	methods indicated in Section III (Evaluation and Qualification Criteria). 31.4 If the monetary value of such non-conformities is found to be more than fifteen percent of the Bid Price of the bidder pursuant to ITB 31.3, such bid shall be considered nonresponsive and shall not be involved in evaluation.
32 Eligibility and Qualification of the Bidder	32.1 The Employer shall determine to its satisfaction during the evaluation of Technical Bids whether Bidders meet the eligibility and qualifying criteria specified in Section III (Evaluation and Qualification Criteria). 32.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17.1. If two or more companies or firms have been merged prior to the submission of the bid, the qualifications of the companies or firms existing prior to such merger shall be deemed to form part of the qualifications of the resulting merged firm or company. 32.3 An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. A negative determination shall result into the disqualification of the Bid, in which event the Employer shall return the unopened Price Bid to the Bidder.
33. Correction of Arithmetical Errors	33.1 During the evaluation of Price Bids, the Employer shall correct arithmetical errors on the following basis: (a) only for unit price Contracts, if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected; (b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; (c) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Price Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Price Bid will be corrected. (d) 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), (b) and (c) above. 33.2 If a Bidder does not accept the correction of arithmetical errors, its bid shall be disqualified and its bid security shall be forfeited.
34 Subcontractors	34.1 In case of Prequalification, the Bidder's Bid shall name the same subcontractor as submitted in the prequalification application and approved by the Employer. In case of Post-qualification, the Employer may permit subcontracting for certain specialized works as indicated in Section III When subcontracting is permitted by the Employer, the sub-contractor shall meet the qualifications criteria as indicated in section III. Sub-contractors' qualification and experience will not be considered for evaluation of the Bidder. The Bidder on its own (without taking into account the qualification and experience of the sub-contractor) should meet the qualification criteria.



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**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	Bidders may propose subcontracting up to the percentage of total value of contracts or the volume of works as specified in the BDS.
35. Evaluation of Price Bids	35.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.
	35.2 To evaluate a Price Bid, the Employer shall consider the following: (a) the bid price, excluding Value Added Tax, and Provisional Sums, in the Summary Bill of Quantities, for Unit Rate Contracts, or Schedule of Prices for lump sum Contracts, but including Day work items, where priced competitively; (b) adjustment for correction of arithmetic errors in accordance with ITB 33.1; (c) adjustment due to discounts offered in accordance with ITB 14.4; (d) adjustment for nonconformities in accordance with ITB 31.3; (e) application of all the evaluation factors indicated in Section III (Evaluation and Qualification Criteria) If the evaluated Bid Price of the Bidder is more than 30 (thirty) percent below the cost estimate, the Employer shall reject the Bid as non-responsive.
	35.3 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.
	35.4 If this Bidding Document allows Bidders to quote separate prices for different lots (Contracts), and to award multiple Contracts to a single Bidder as specified in BDS , the methodology to determine the lowest evaluated price of the Contract combinations, including any discounts offered in the Letter of Price Bid, is specified in Section III (Evaluation and Qualification Criteria).
	35.5 If the bid for an Unit Rate Contract, evaluated as per ITB 36.1 is seriously unbalanced or front loaded in the opinion of the Employer, the Employer may require the Bidder to produce detailed rate analysis for any or all items of the Bill of Quantities as per ITB 27.1, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the rate analysis, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder as mentioned in BDS to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract or may consider the bid as non-responsive.
	35.6 In case of e-submission bids, the Employer evaluates the bid on the basis of the information in the electronically submitted bid files. If the Bidder cannot substantiate or provide evidence to establish the information provided in e-submitted bid through documents/ clarifications as per ITB Clause 27.1, the bid shall not be considered for further evaluation.
	35.7 In Case, a corruption case is being filed to Court against the Natural Person or Board of Director of the firm/institution /company or any partner of JV, such Natural Person or Board of Director of the firm/institution /company or any partner of JV such bidder's bid shall be excluded from the evaluation, if public entity receives instruction from Government of Nepal.



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**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	35.8 If all the Bids evaluated are substantially higher than the cost estimate, the employer may negotiate with the bidder whose evaluated Bid Price is closest to the cost estimate to propose a lump sum discount rate in order to bring the bid price within the approved cost estimate. However, no change in the substance of the bid is permitted during the negotiations.
36. Comparison of Bids	36.1 The Employer shall evaluate all the bid prices of the substantially responsive bids in accordance with ITB 35.2. The Employer shall determine the Average Bid Price of all the substantially responsive Bids. The Bid Price which is closest to the Average Bid Price AND is not substantially higher than the cost estimate shall be selected for awarding the contract. In case two or more Bid Prices are determined to be equally closest to the Average Bid Price, the Bid Price which is below the Average Bid Price shall be selected for awarding the contract. 36.2 While evaluating the Bid Price as per ITB 36.1, if the Bid Price of two or more Bidders is found to be equal, the Employer shall select the bid for awarding the contract by drawing of lots in presence of Bidders' designated representatives who choose to attend in date, time and place as notified by the Employer in writing to the concerned bidders. The Bidders' representatives who are present shall be requested to sign a record evidencing their attendance. The omission of a Bidder's signature on the record or the absence of a Bidder during the drawing of lots shall not invalidate the contents and the effect of the record. The method of drawing of lots shall be determined by the Employer.
37. Employer's Right to Accept Any Bid, and to Reject Any or All Bids	37.1 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. 37.2 The public entity shall give notice of the rejection of bids or the cancellation of the procurement proceedings pursuant to ITB 37.1, along with the reasons for such rejection or cancellation, to all bidders. 37.3 Where any bidder requests, within thirty (30) days of the communication of the notice pursuant to ITB 37.2, the grounds for the rejection of all bids or the cancellation of the procurement proceedings, the public entity shall provide such information to that bidder.
F. Award of Contract	
38. Award Criteria	38.1 The Employer shall award the Contract to the Bidder whose Bid Price is selected as per ITB 35.8, ITB 36.1 or ITB 36.2 and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.
39. Letter of Intent to Award the Contract/Notification of Award	39.1 The Employer shall notify the concerned Bidder whose bid has been selected in accordance with ITB 38.1 within seven days of the selection of the bid, in writing that the Employer has intention to accept its bid and the information regarding the name, address and amount of selected bidder shall be given to all other bidders who submitted the bid. 39.2 After issuance of the notice under ITB 39.1 if the concerned bidder provides information pursuant to ITB 4.10 regarding saturation of maximum number of contracts, the employer shall disqualify the bidder and shall select the next Bidder



Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	whose Bid Price is closest to the previously determined Average Bid Price in accordance with ITB 38.1 and notify accordingly as per ITB 39.1. 39.3 If no bidder submits an application pursuant to ITB 42 within a period of seven days of the notice provided under ITB 39.1, the Employer shall, accept the bid selected in accordance with ITB 38.1 and Letter of Acceptance shall be communicated to the selected bidder prior to the expiration of period of Bid validity, to furnish the performance security and sign the contract within fifteen days. 39.4 After communicating letter of acceptance under ITB 39.3, if the concerned bidder provides information pursuant to ITB 4.10 regarding saturation of maximum number of contracts, the employer shall reject the bid of that bidder and shall select the next Bidder whose Bid Price is closest to the previously determined Average Bid Price in accordance with ITB 38.1 and shall issue the notice accordingly as per ITB 39.1. In such case bid security of the rejected bidder shall not be forfeited. 39.5 In Case, a corruption case is being filed to Court against the Natural Person or Board of Director of the firm/institution /company or any partner of JV, such Natural Person or Board of Director of the firm/institution /company or any partner of JV such bidder's bid shall be excluded from the evaluation, if public entity receives instruction from Government of Nepal.
40. Performance Security	40.1 Within Fifteen (15) days of the receipt of Letter of Acceptance from the Employer, the successful Bidder shall furnish the performance security in an amount equal to 5 (five) percent of the Bid Price in accordance with the Conditions of Contract and subject to ITB 35.5, from Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law in Nepal using Sample Form for the Performance Security included in Section X (Contract Forms), or another form acceptable to the Employer. The performance security issued by any foreign Bank outside Nepal must be counter guaranteed by Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law in Nepal. The Bid Price shall be without VAT but including Provisional Sum. 40.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement 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 next Bidder whose Bid Price is closest to the previously determined Average Bid Price in accordance with ITB 38.1 whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily. The process shall be repeated according to ITB 39.
41 Signing of Contract	41.1 The Employer and the successful Bidder shall sign the Contract Agreement within the period as stated ITB 40.1. 41.2 At the same time, the Employer shall affix a public notice on the result of the award on its notice board and make arrangement for causing such notice to be affixed on the notice board also of the District Coordination Committee, District Administration Office, Provincial Treasury and Controller Office and District Treasury and Controller Office. The Employer may make arrangements to post the notice into its website, if it has; and if it does not have, into the website of the Public Procurement Monitoring Office, identifying the bid and lot numbers and the following information: (i) the result of evaluation of bid; (ii) date of publication of notice inviting bids; (iii) name of newspaper; (iv) reference number of notice; (v) item of procurement; (vi) name and address of bidder making contract and (viii) contract price



**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

	41.3 Within thirty (30) days from the date of issuance of notification pursuant to ITB 39.1 unsuccessful bidders may request in writing to the Employer for a debriefing seeking explanations on the grounds on which their bids were not selected. The Employer shall promptly respond in writing to any unsuccessful Bidder who, requests for debriefing.
	41.4 If the bidder whose bid has been accepted fails to sign the contract as stated ITB 40.1, the Public Procurement Monitoring Office shall blacklist the bidder on recommendation of the Public Entity.
42. Complaint and Review	42.1 If a Bidder is dissatisfied with the Procurement proceedings or the decision made by the Employer in opening of the price bid or the intention to award the Contract, it may file an application to the Chief of the Public Entity within Seven (7) days of providing the notice under ITB 25.8 and ITB 39.1 by the Public Entity, for review of the proceedings stating the factual and legal grounds.
	42.2 Late application filed after the deadline pursuant to ITB 42.1 shall not be processed.
	42.3 The chief of Public Entity shall, within five (5) days after receiving the application, give its decision with reasons, in writing pursuant to ITB 42.1: (a) whether to suspend the procurement proceeding and indicate the procedure to be adopted for further proceedings; or (b) to reject the application. The decision of the chief of Public Entity shall be final for the Bid amount up to the value as stated in 42.4.
	42.4 If the Bidder is not satisfied with the decision of the Public Entity in accordance with ITB 42.3, or the decision is not given within five (5) days of receipt of application pursuant to ITB 42.1, it can, within seven (7) days of receipt of such decision, file an application to the Public Procurement Review Committee of the GoN, stating the reason of its disagreement on the decision of the chief of Public Entity and furnishing the relevant documents, provided that its Bid amount ,equal or more than Rupees Twenty Million (NRs. 20,000,000). The application may be sent by hand, by post, by courier, or by electronic media at the risk of the Bidder itself.
	42.5 Late application filed after the deadline pursuant to ITB 42.4 shall not be processed.
	42.6 Within three (3) days of the receipt of application from the Bidder, pursuant to ITB 42.4, the Public Procurement Review Committee shall notify the concerning Public Entity to furnish its procurement proceedings, pursuant to ITB 42.3.
	42.7 Within three (3) days of receipt of the notification pursuant to ITB 42.6, the Public Entity shall furnish the copy of the related documents to the Public Procurement Review Committee.
	42.8 The Public Procurement Review Committee, after inquiring from the Bidder and the Public Entity, if needed, shall give its decision within thirty (30) days of the receipt of the application filed by the Bidder, pursuant to ITB 42.4.
	42.9 The Bidder, filing application pursuant to ITB 42.4, shall have to furnish a cash amount or Bank guarantee from Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law equivalent to ten percent



Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	(10 %) of amount of bid security in case of complaint against decision pursuant to ITB 25.8 and one percent (1%) of its quoted Bid amount in case of complaint against decision pursuant to ITB 39.1 with the validity period of at least ninety (90) days from the date of the filing of application pursuant to ITB 42.4.
	42.10 If the claim made by the Bidder pursuant to ITB 42.4 is justified, the Public Procurement Review Committee shall have to return the security deposit to the applicant, pursuant to ITB 42.9, within seven (7) days of such decision made.
	42.11 If the application submitted by the Bidder pursuant to ITB 42.4 is dismissed by the Public Procurement Review Committee, the security deposit (Cash or Bank Guarantee) submitted by the Bidder pursuant to ITB 42.9 shall be forfeited.
	42.12 If the Employer does not implement the decision of the Public Procurement Review Committee, the bidder may file an application to the Public Procurement Review Committee.

Section II: Bid Data Sheet

A. General	
ITB 1.1	The number of the Invitation for Bids is: <i>UAHEL/083/84/SS-01</i>
ITB 1.1	The Employer is: <i>Upper Arun Hydroelectric Limited., Maharajgunj, Kathmandu</i>
ITB 1.1	The number and identification of lots (contracts) comprising this bidding process is: <i>Design, Supply, Installation, Testing and Commissioning 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District</i>
ITB 2.1	The name of the Project is <i>Design, Supply, Installation, Testing and Commissioning 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District</i> The implementing agency is <i>Upper Arun Hydroelectric Limited, Maharajgunj, Kathmandu</i> GoN Funded or DP Funded: GoN Funded
ITB 4.1 (a)	For GoN Funded: Maximum number of partners in a joint venture shall be: 3 (Three)
ITB 4.4	For GoN: blacklist.ppmo.gov.np
ITB 4.9 & 4.10	For GoN Funded: The Bidder, including all parties constituting the Bidder, shall be ineligible to participate in the open competitive bidding process if it has already secured five (5) number of construction contracts (in open competitive bidding) and has not yet completed the work as stipulated in the respective contracts. Following Procurement of Works contracts shall not be counted for this purpose: a) The works for which tender were invited or contracts accepted before 2078-12-03 B.S (March 17, 2022 A.D). b) The works for which tender were invited and contracts accepted after 2078-12-03 B.S (March 17, 2022 A.D) but the work acceptance report has been approved according to Rule 117 of PPR. c) The works for which tenders were invited or contracts accepted under all types of foreign assistance.
B. Bidding Document	
ITB 7.1	For clarification purposes only, the Employer's address is: Attention: Upper Arun Hydroelectric Limited Address: Maharajgunj, Kathmandu Tel: +977-1-4720543, +977-1-4720553 Email: uahepnea@gmail.com, upperarun@nea.org.np
ITB 7.4	A pre-bid meeting " <i>shall</i> " held. Pre-Bid Meeting will take place at the following date, time and place: <i>Date: August 25, 2026</i> <i>Time: 14:00 Hrs.</i> Place: Upper Arun Hydroelectric Limited Address: Maharajgunj, Kathmandu Tel: +977-1-4720543, +977-1-4720553

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

	A site visit " shall not be "-organized by the Employer. However, the bidder is advised to visit the site before bidding.
ITB 7.5	Time for request: Requests for clarification should be received by the Employer no later than 10 days prior to the deadline for submission of bids.
C. Preparation of Bids	
ITB 10.1	The language of the bid is: English / Nepali
ITB 11.2 (i)	The Bidder shall submit with its Technical Bid the following additional documents: <i>Manufacturer's Authorization Letter</i>
ITB 11.3 (b)	In accordance with ITB 12 and ITB 14, the following schedules shall be submitted with the bid, including the priced Bill of Quantities for Unit Rate Contracts and Schedule of Prices for lump sum contracts: N/A
11.3 (e)	The Bidder shall submit with its Price Bid the following additional documents: N/A
ITB 13.1	Alternative bids shall not be permitted.
ITB 13.2	Alternative times for completion shall not be permitted.
ITB 13.4	Alternative technical solutions shall be permitted for the following parts of the Works: N/A
ITB 14.6	The prices quoted by the Bidder shall not be subject to adjustment during the performance of the Contract.
ITB 18.1	The bid validity period shall be: 120 days .
ITB 19.1	The Bidder shall furnish a bid security, from Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law with a minimum of NRs. 3,9,11,000.00 which shall be valid for 30 days beyond the validity period of the bid. i.e. 150 Days .
ITB 19.2 (b)	Name of the Bank: Sanima Bank Limited, Narayanchaur, Naxal Name of Office: UPPER ARUN HYDROELECTRIC LIMITED Office Account No.: 001010010004770
ITB 20.1	In addition to the original of the bid, the number of copy/ies is/are: N/A
ITB 20.2	The written confirmation of authorization to sign on behalf of the Bidder shall indicate: (a) The name and description of the documentation required to demonstrate the authority of the signatory to sign the Bid such as a Power of Attorney; and (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, and (ii) nominating a 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.
D. Submission and Opening of Bids	
ITB 21.1	Bidders shall have the option of submitting their bids " by electronic only ".

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

ITB 22.1	For bid submission purposes only, the Employer's address is : PPMO's e-GP system www.bolpatra.gov.np/egp The deadline for bid submission is: <i>Date: September 04, 2026.</i> <i>Time: 12:00 PM</i>
ITB 25.1	The Technical Bid opening shall take place at: Address: <i>Upper Arun Hydroelectric Limited, Maharajgunj, Kathmandu</i> <i>Date: September 04, 2026.</i> <i>Time: 14:00 PM</i>
E. Evaluation and Comparison of Bids	
ITB 34.1	Contractor's proposed subcontracting: Maximum percentage of subcontracting permitted is: 25% of the total contract amount without VAT but including PS.
ITB 35.5	The amount of the performance security be increased by Eight (8) percent of the quoted bid price.

Section III: Evaluation and Qualification Criteria

This Section contains all the criteria that the Employer shall use to evaluate bids and qualify Bidders by post-qualification exercise. GoN/DP requires bidders to be qualified by meeting predefined, precise minimum requirements. The method sets pass-fail criteria, which, if not met by the bidder, results in disqualification. In accordance with ITB 32 and ITB 35, no other methods, criteria and factors shall be used. The Bidder shall provide all the information requested in the forms included in Section IV (Bidding Forms).

1. Evaluation

In addition to the criteria listed in ITB 35.2 (a) - (e) the following criteria shall apply:

1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity, to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section VI (Works Requirements).

Non-compliance with equipment and personnel requirements described in Section VI (Works Requirements) shall not be grounds for bid rejection and such non-compliance will be subject to clarification and rectification prior to contract award.

1.2 Multiple Contracts

N/A

1.3 In Case, other than Multiple Contracts

1.4 Completion Time

N/A

1.5 Alternative Technical Solutions

N/A

1.6 Quantifiable Nonconformities and Omissions

N/A

1.7 Functional Guarantees of the Facilities

The minimum and/or maximum requirements stated in the Specification for functional guarantees required in the Specification are given in the table below. When evaluating the individual bid received from various bidders, the power transformer shall be evaluated for the cost of losses as given below:

Functional Guarantee [as required in the Specification, e.g., performance, efficiency, consumption, etc.]	Capitalization Amount
1. Transformer No Load Loss per kW	USD 5670.00
2. Transformer Load Loss per kW	USD 2690.00
3. Loss associated with cooling fan per kW	USD 1420.00

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

The bidder shall furnish guaranteed no load and full load loss data at rated full load capacity as specified in form of the transformers along with the bid for all ratings of power transformers.

No tolerance shall be permitted on the quoted guaranteed value while applying penalty for exceeded loss value. If the individual loss of Power **transformer measured during test exceeds** the values guaranteed in the Bid, then for each kilowatt of losses in excess of the losses guaranteed, an amount at the rate of twice the capitalized rate specified above for no-load losses and load-losses shall be deducted from the Contract Price of the successful bidder.

When evaluating the individual bid received from various Bidders, the transformer shall be evaluated for the cost of losses based on the following relation.

$$P_E = P_b + K_L \times L_L + K_{NL} \times L_{NL} + K_{CL} \times L_{CL}$$

P_E = Evaluated Price

P_b = Bid Price

K_L = Value of Load Loss

L_L = Guaranteed Load Losses at rated Current (Maximum MVA base)

K_{NL} = Value of no Load Loss

L_{NL} = Guaranteed no Load Loss

K_{CL} = Value of Cooler Loss

L_{CL} = Guaranteed Cooler Loss

The transformer losses shall be capitalized as follows:

- a) Value of No Load Losses: US\$ 5670.00 per kW
- b) Value of Load Losses: US\$ 2690.00 per kW
- c) Loss associated with cooling fan load: US\$ 1420.00 per kW

If the bidder quote unrealistic and unachievable guaranteed transformer loss values (no-load or load losses), then the Employer may ask the bidder to submit technical justifications to substantiate such guaranteed losses. If the justifications are not satisfactory, the proposed transformers shall be rejected and the bid shall be considered non-responsive.

If the individual losses of a power transformer as measured during test exceeds the values guaranteed in the Bid with in the tolerances permitted by relevant standards, then for each kilowatt losses in excess of the losses guaranteed, an amount at the rates of twice the rates of specified in clause 6.1 for no load losses and cooling (fan) losses shall be deducted from the Contract Price of the successful Bidder.

Any Transformer shall be rejected if losses exceed the guaranteed value by an amount in excess of the following.

Total Losses: 10%

Component Losses: 15% (unless the total loss exceeds 10%)

In case of loss capitalization, no tolerance shall be permitted for the guaranteed value.

2 Qualification

2.7 Eligibility

Criteria		Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
2.1.1 Nationality					
Nationality in accordance with ITB sub-clause 4.2	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid Forms ELI –1; ELI –2 with attachments
2.1.2 Conflict of Interest					
No conflicts of interest in accordance with ITB Sub-Clause 4.3.	must meet requirement	existing or intended JV must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
2.1.3 Government/ DP Eligibility					
Not having been declared ineligible by government /DP, as described in ITB Sub-Clause 4.4.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
2.1.4 Government-owned Entity					
Bidder required to meet conditions of ITB Sub-Clause 4.5.	must meet requirement	existing or intended JV must meet requirement	must meet requirement	not applicable	Letter of Technical Bid, Forms ELI - 1, ELI - 2, with attachments
2.1.5 UN Eligibility					
Not having been declared ineligible based on a United Nations resolution or Employer's country law, as described in ITB Sub-Clause 4.7.	must meet requirement	existing or intended JV must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
2.1.6 Bidder’s Running Contracts					

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

Bidders have not yet secured five (5) number of construction Contracts ¹ (in open competitive bidding) as described in ITB Sub-Clause 4.9.	must meet requirement	existing or intended JV must meet requirement	must meet requirement	not applicable	Letter of Technical Bid, Form ELI-3
2.1.7 Other Eligibility					
Firm or Company Registration Certificate	must meet requirement	not applicable	must meet requirement	not applicable	Document attachment
Business Registration License	must meet requirement	not applicable	must meet requirement	not applicable	Document attachment
VAT and PAN Registration certificate <i>(only for domestic bidders)</i>	must meet requirement	not applicable	must meet requirement	not applicable	Document attachment
Tax Clearance Certificate/Tax return submission evidence/evidence of time extension for the F/Y 2081/082 <i>(Only for domestic bidders)</i>	must meet requirement	not applicable	must meet requirement	not applicable	Document attachment

2.8 Pending Litigation

Criteria		Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	

2.2.1 Pending Litigation

All pending litigation shall be treated as resolved against the Bidder and so shall in total not represent more than 50% percent of the Bidder's net worth.	must meet requirement by itself or as partner to past or existing JV	not applicable	must meet requirement by itself or as partner to past or existing JV	not applicable	Form LIT - 1
---	--	----------------	--	----------------	--------------

¹ Following Procurement of Works contracts shall not be counted for this purpose:

a) The works for which tender were invited or contracts accepted before 2078-12-03 B.S (March 17, 2022 A.D)

b) The works for which tender have been invited and contracts accepted after 2078-12-03 B.S (March 17, 2022 A.D) but the work acceptance report has been approved according to Rule 117 of PPR.

c) The works for which tenders were invited or contracts accepted under all types of foreign assistance.



**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

2.9 Financial Situation

Criteria		Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	

2.3.1 Historical Financial Performance

Submission of audited balance sheets and income statements, for the last 3 years to demonstrate the current soundness of the Bidder's financial position. As a minimum, a Bidder's net worth for the last year calculated as the difference between total assets and total liabilities should be positive.	must meet requirement	not applicable	must meet requirement	not applicable	Form FIN - 1 with attachments
---	-----------------------	----------------	-----------------------	----------------	-------------------------------

2.3.2 Average Annual Construction Turnover

Minimum average annual construction turnover of NRs. 232,594,000.00 calculated as total certified payments received for construction contracts in progress or completed, within best three years out of last ten fiscal years.	must meet requirement	must meet requirement	must meet 25% of the requirement	must meet 40% of the requirement	Form FIN - 2
---	-----------------------	-----------------------	----------------------------------	----------------------------------	--------------

2.3.3 Financial Resources

Using Forms FIN - 3 and FIN - 4 in Section IV (Bidding Forms) the Bidder must demonstrate access to, or availability of, financial resources such as liquid assets ² , unencumbered real assets, and other financial resources, (other than any contractual advance payments) to meet the cash-flow requirement of NRs. 64,610,000.00 .	must meet requirement	must meet requirement	must meet 25% of the requirement	must meet 40% of the requirement	Form FIN - 3
---	-----------------------	-----------------------	----------------------------------	----------------------------------	--------------

² Liquid Assets mean cash and cash equivalents, short-term financial instruments, short term available-for-sale-securities, marketable securities, trade receivables, short-term financing receivables and other assets that can be converted into cash within ONE YEAR.



Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

2.3.4 Required Bid Capacity					
The bidding capacity of the bidder should be equal to or more than the NRs. 139,600,000.00.	must meet requirement	must meet requirement	must meet 25% of the requirement	must meet 40% of the requirement	Form FIN - 4 and Form FIN - 5

2.10 Experience

Criteria		Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture			Submission Requirement
		All Partners Combined	Each Partner	One Partner	
2.4.1 General Construction Experience					
Experience under construction contracts in the role of contractor, subcontractor, or management contractor for at least the last 5 years prior to the applications submission deadline.	must meet Requirement	not applicable	must meet requirement	not applicable	Form EXP - 1
2.4.2 Specific Construction Experience					
(a) Contracts of Similar Size and Nature					
Participation as Prime contractor, management contractor, or subcontractor, within the last ten (10) years, that have been successfully or are substantially ^a completed and that are similar to the proposed works. The similarity shall be based on the physical size, complexity, methods, technology or other characteristics as described; <i>The similarity here shall mean Design, Supply, Delivery and Installation, Testing, Commissioning of 33/11kV or higher Voltage Substation.</i>	must meet requirement, in at least One (1) Contract with a value of at least NRs 93,038,000.00	not applicable	not applicable	must meet requirement, in at least One (1) Contract with a value of at least NRs 93,038,000.00	Form EXP – 2(a)

^a A contract for which a Taking-Over Certificate has been issued shall be considered as substantially completed.

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

(b) Construction Experience in Key Activities					
Participation as Prime contractor, management contractor, or subcontractor, within a last ten (10) years, For the above or other contracts stipulated in 2.4.2(a) above, a minimum construction experience in the following key activities that have been successfully or substantially^a completed: 1) <i>Supply, Delivery and Installation, Testing, Commissioning of one 33/11kV or higher voltage Substation and same shall be in successful operation for at least one year.</i>	must meet all requirements	must meet all requirements	not applicable	not applicable	Form EXP - 2(b)

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

2.5 Manufacturer's Experience

Manufacturers for the following major items of Supply or services must meet the following minimum criteria, herein listed for that item. Failure to comply with this requirement will result in rejection of the Bidder.

Bidders may propose manufacturers other than those specified or referenced in the Bidding Documents, provided that the proposed manufacturers and their products fully comply with all the specified technical, quality, performance, and other applicable requirements. The acceptance of any alternative manufacturer shall be subject to the Employer's review and approval in accordance with the Contract.

Item No.	Description of Item	Minimum Criteria to be met
1.	Power transformer (33kV or higher voltage)	i. Must have manufacturing experience of at least 5(Five) years. ii. Must have successfully completed the supply of power transformer of capacity 6/8 MVA or higher capacity, 33kV or higher Voltage Class, at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall have been in operation satisfactory to the end users for at least One (1) year. iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid. iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class
2.	12 V switchgear	i. Must have manufacturing experience of at least 5(Five) years. ii. Must have successfully completed the supply of 12kV switchgear, at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall have been in operation satisfactory to the end users for at least One (1) year. iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class and capacity.
3.	36 kV outdoor switchgear	i. Must have manufacturing experience of at least 5(Five) years. ii. Must have successfully completed the supply of 36kV outdoor switchgear, at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class and capacity.
4.	Disconnecting switch (DS), instrument transformer (CT & PT), lightning arrestor (LA)	i. Must have manufacturing experience of at least 5(Five) years. ii. Must have successfully completed the supply of Disconnecting switch (DS), Instrument transformer (CT & PT), Lightning Arrestor (LA), at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall have been in operation satisfactory to the end users for at least One (1) year. iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class and capacity.

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

5	Control & relay panel (C&RP)	i. Must have manufacturing experience of at least 5(Five) years. ii. Must have successfully completed the supply of Control & Relay Panel (C&RP), at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall have been in operation satisfactory to the end users for at least One (1) year. iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class and capacity.
6	Battery and Charger	i. Must have manufacturing experience of at least 5 (Five) years. ii. Must have successfully completed the supply of Battery and Charger, at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall have been in operation satisfactory to the end users for at least One (1) year. iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class and capacity.
7	XLPE Cable (12kV or higher voltage class)	i. Must have manufacturing experience of at least 5(Five) years. ii. Must have successfully completed the supply of XLPE Cable of 12kV or higher Voltage class, at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall have been in operation satisfactory to the end users for at least One (1) year. iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class and capacity.
8	Station Transformer with 33/0.4 KV, 100 KVA Rating	i. Must have manufacturing experience of at least 5(Five) years. ii. Must have successfully completed the supply of Station transformer of capacity 100 KVA or higher capacity, at least twice the bid quantity as a main supplier over last five (5) years period ending on the last date of bid submission. Out of supplied quantity, a minimum of half the bid quantity shall have been in operation satisfactory to the end users for at least One (1) year. iii. Must hold a valid ISO Certificate & copy of certificate shall be included in the bid iv. Must submit the type test report carried out by independent testing laboratory for the offered item or higher voltage class and capacity.

Note:

- i. In the case of a Bidder who offers to supply and install major items of plant under the contract, which the Bidder did not manufacture or otherwise produce, the Bidder shall provide the Manufacturer's authorization, showing that the Bidder has been duly authorized by the Manufacturer or producer of the related plant and equipment or component to supply and install that item in the Employer's country
- ii. Upon award of the contract, undertake to carry out the required Type Test from an independent laboratory before delivery of the corresponding equipment at no extra cost to the Client/Employer.
- iii. The end user certificates shall be on the letterhead of the end user with valid address for correspondence and signed by or on behalf of the end user.

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

- iv. The offered equipment, plants and materials shall be in conformity with the specifications. In order to prove that the equipment, plants, and materials offered are of acceptable quality and standard and in conformity with the specifications, the Bidder shall furnish documentary evidence in the form of literature, drawing and data and shall furnish:
- Completely filled out technical data sheets provided in the Bidding Document;
 - A detailed description of equipment, plants, and materials offered are to the specification or a statement of deviations and exceptions to provision of the specifications.

2.6. Subcontractors

N/A

Section IV: Bidding Forms

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

Letter of Technical Bid

The Bidder must accomplish the Letter of Bid in its letter head clearly showing the Bidder's complete name and address.

Date:

Name of the contract:

Invitation for Bid No.:

To: ***[Insert Complete name of Employer]***

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) Clause 8.
- (b) We offer to execute in conformity with the Bidding Documents the following Works: ***[Insert Description of the works]***
- (c) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of ***[insert validity period as specified in ITB 18.1 of the BDS]*** days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (d) Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2 and meet the requirements of ITB 3.4,& ITB 3.5
- (e) We are not participating, as a Bidder or as a subcontractor, in more than one Bid in this bidding process in accordance with ITB 4.3(e), other than alternative offers submitted in accordance with ITB 13.
- (f) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible by DP, under the Employer's country laws or official regulations or by an act of compliance with a decision of the United Nations Security Council;
- (g) [We are not a government owned entity] / [We are a government owned entity but meet the requirements of ITB 4.5];¹
- (h) We declare that, we including any subcontractors or suppliers for any part of the contract do not have any conflict of interest in accordance with ITB 4.3 and we have not been punished for an offense relating to the concerned profession or business.
- (i) We declare that we are solely responsible for the authenticity of the documents submitted by us. The document and information submitted by us are true and correct. If any document/information given is found to be concealed at a later date, we shall accept any legal actions by the Employer.
- (j) We agree to permit the Employer/DP or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by the Employer.
- (k) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section VI (Works Requirement) and our technical proposal, or as otherwise agreed with the Employer.

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

- (l) We declare that we have not yet secured five (5)³ number of construction contract (in open competitive bidding) as described in ITB Sub-Clause 4.9.

Name: *[insert complete name of the person signing the Bid]*.....

In the capacity of *[insert legal capacity of person signing the Bid]*.....

Signed *[signature of the person whose name and capacity are shown above]*.....

Duly authorized to sign the Bid for and on behalf of *[insert complete name of the Bidder]*.....

Date *[insert date of signing]*.....

¹ Note: Use one of the two options as appropriate.

³ Note: Following Procurement of Works contracts shall not be counted for this purpose:

- a) The works for which tender were invited or contracts accepted before 2078-12-03 B.S (March 17, 2022 A.D).
- b) The works for which tender have been invited and contracts accepted after 2078-12-03 B.S (March 17, 2022 A.D) but the work acceptance report has been approved according to Rule 117 of PPR.
- c) The works for which tenders were invited or contracts accepted under all types of foreign assistance.

Letter of Price Bid

The Bidder must accomplish the Letter of Price Bid in its letterhead clearly showing the Bidder's complete name and address.

Date:

Name of the contract:

Invitation for Bid No.:

To: ***[Insert Complete name of Employer]***

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) Clause 8;

We offer to execute in conformity with the Bidding Documents the following Works: ***[Insert Description of the works]***.

- (c) The total price of our Bid, excluding any discounts offered in item (d) below is: ***[Insert one of the options below as appropriate]*** or when left blank is the Bid Price indicated in the Bill of Quantities.

Option 1, in case of single contract: Total price is: ***[insert the total price of the Bid in words and figures]***;

Or

Option 2, in case of multiple lots (contracts): (i) Total price of each lot (contracts): ***[insert the total price of each lot in words and figures]***; (ii) Total price of subject contract [say Lot1] and Lot2 [another contract] ***[insert the total price in words and figures]***; (iii) Total price of subject contract [say Lot1] and Lot3 [another contract] ***[insert the total price in words and figures]***; Total price of subject contract [say Lot1], Lot2 [another contract], Lot3 [another contract], ***[insert the total price in words and figures]***;

- (d) The discounts offered and the methodology for their application for subject contract [single contract] are: [For Bidding Documents not provisioning multiple contracts]

Add following if Bidding Document provisions applicability of multiple contracts:

The discounts offered and the methodology for their application for subject contract [say Lot1] and Lot2 [another contract] are:

The discounts offered and the methodology for their application for subject contract [say Lot1] and Lot3 [another contract] are:

The discounts offered and the methodology for their application for subject contract [say Lot1], Lot2 [another contract] and Lot3 [another contract],, are:

[Note:

1. Formulate possible combinations depending upon the number of lots under Bidding Process and modify accordingly Paragraph (c) and (d)]

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

- (e) Our bid shall be valid for a period of ***[insert validity period as specified in ITB 18.1]*** days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (f) If our bid is accepted, we commit to obtain a performance security in accordance with the Bidding Document;
- (g) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract:⁴

Name of Recipient	Address	Reason	Amount
.....			
.....			

- (h) We understand that this bid, *together with your written acceptance thereof* included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed;
- (i) We understand that you are not bound to accept the bid **closest to the Average Bid Price** or any other bid that you may receive; and
- (j) We declare that we are solely responsible for the authenticity of the documents submitted by us.
- (k) We agree to permit the Employer/DP or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by the Employer.

Name: ***[insert complete name of the person signing the Bid]***.....

In the capacity of ***[insert legal capacity of person signing the Bid]***.....

Signed ***[signature of the person whose name and capacity are shown above]***

Duly authorized to sign the Bid for and on behalf of ***[insert complete name of the Bidder]***.....

Date ***[insert date of signing]***.....

⁴ If none has been paid or is to be paid, indicate "None".

Table of Price Adjustment Data⁶ [NOT APPLICABLE]

[To be used if Price Adjustment is applicable as per GCC 53.1]

Code	Index Description	Source of Index*	Base Value and Date	Employer's Proposed Weighting Range (coefficient)	Bidder's Proposed Weighting (coefficient)**
1	2	3	4	5	6
	Non - Adjustable (A)			0.15	0.15
	Labor (b)				
	Materials (c)				
	Equipment usage (d)				
		Total			1.00

*Normally following source of index shall apply. Public Entity shall choose applicable Index for each item.

- (a) Labor: "National Salary and Wage Rate Index" - "Construction Labor" of Nepal Rastra Bank or rate fixed by District Rate Fixation Committee
- (b) Material: "National Wholesale Price Index" - Construction Materials" of Nepal Rastra Bank
- (c) Equipment usage: "National Wholesale Price Index" - Machinery and Equipment" of Nepal Rastra Bank or "Fuel" Price fixed by Nepal Oil Corporation.

** Bidders proposed weightings should be within the range specified by the Employer in column - 5

⁶ Non-compliance of the data (stipulated by the bidder in this table) with requirements described here shall not be grounds for bid rejection and such non-compliance will be subject to clarification and rectification prior to contract award.

Table of Price Adjustment Data⁷ [NOT APPLICABLE]

[To be used if Price Adjustment is applicable as per GCC 53.6]

Code	Construction Material*	Unit	Base Price (NRs/Unit) (Ex-factory)	Source (Factory)**
1	2	3	4	5

* Major construction materials to be specified by Employer in column - 2.

** Base Price and source normally to be specified by Employer (or alternatively informed to be proposed by bidder) in column 4 and 5.

Note:

The base prices of the construction materials shall be taken as of 30 days before the deadline for submission of the Bid as quoted by the Bidder and verified by the Employer. For the purpose of calculation of price adjustment, the Ex-factory price of the same source shall be taken into consideration.

⁷ Non-compliance of the data (stipulated by the bidder in this table) with requirements described here shall not be grounds for bid rejection and such non-compliance will be subject to clarification and rectification prior to contract award.

Bid Security

Bank Guarantee

Bank's Name, and Address of Issuing Branch or Office

(On Letter head of the Bank)

Beneficiary:[Insert name and address of Employer]

Date: Bid Security No.:

We have been informed that. [insert name of the Bidder] (hereinafter called "the Bidder") intends to submit its bid (hereinafter called "the Bid") to you for the execution of [Insert name of Contract] under Invitation for Bids No. [insert IFB No.] ("the IFB").

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we..... [Insert name of Bank] hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of Nepalese Rupees[Insert amount in figures and amount in words} upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

(a) has withdrawn or modifies its Bid:

i) during the period of bid validity specified by the Bidder on the Letter of Technical and Price Bid, in case of electronic submission

(ii) from the period twenty-four hours prior to bid submission deadline up to the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid, in case of hard copy submission; or

(b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or

(c) changes the prices or substance of the bid while providing information pursuant to clause 27.1 of ITB; or

(d) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Agreement, or (ii) fails or refuses to furnish the performance security, in accordance with the ITB; or

(e) is involved in fraud and corruption in accordance with the ITB; or

(f) if the bidder fails to inform about the saturation of the maximum number of contracts as per ITB 4.10.

This guarantee will remain in force up to and including the date **number** days after the deadline for submission of Bids as such deadline is stated in the instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

This Bank guarantee shall not be withdrawn or released merely upon return of the original guarantee by the Bidder unless notified by you for the release of the guarantee.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG), 2010 Revisions, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

... Bank's seal and authorized signature(s) ...

Note:

The bid security of has been counter guaranteed by the Bank on
..... (Applicable for Bid Security of Foreign Banks).



Technical Proposal Format

Personnel

Equipment

Site Organization

Method Statement

Mobilization Schedule

Construction Schedule

Others

Personnel

Form PER - 1: Proposed Personnel

Bidders should provide the names of suitably qualified personnel to meet the specified requirements for each of the positions listed in Section VI (Work Requirements). The data on their experience should be supplied using the Form below for each candidate.

No.	Name	Position*	Academic Qualification	Total Work Experience [Years]	Experience in Similar Works [years]
1.					
2.					
3.					
4.					
5.					

* As listed in Section VI (Work Requirements).

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

Form PER - 2: Resume of Proposed Personnel

The Bidder shall provide all the information requested below.

Position*		
Personal 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 twenty years in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company, Project, Position and Relevant Technical and Management Experience

Equipment

Form EQU: Equipment

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section VI (Work Requirements). A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

(i) For the equipment under Bidder's ownership

No.	Equipment Type and Characteristics	Total Nos. of Equipment under Bidder's Ownership	No. of Equipment engaged/proposed for ongoing/committed contracts	Nos. of Equipment proposed for this contract
1.				
2.				
3.				
4.				
5.				

(ii) For the Equipment to be leased/hired

No.	Equipment Type and Characteristics	Total Nos. of Equipment under the ownership of lease/hire provider	No. of Equipment engaged/committed for other works	Nos. of Equipment proposed to be leased/hired for this contract
1.				
2.				
3.				
4.				
5.				

Type 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	

The following information shall be provided only for equipment not owned by the Bidder.

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

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

The Bidder shall be solely responsible for the data provided. However, this shall not limit the right of Employer to verify the authenticity of submitted information.

Bidder's Information and Qualification Format

Site Organization

Method Statement

Mobilization Schedule

Construction Schedule

Others

Bidder's Qualification

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: Bidder's Information Sheet

Bidder's Information	
Bidder's legal name	
In case of JV, legal name of each partner	
Bidder's country of constitution	
Bidder's year of constitution	
Bidder's legal address in country of constitution	
Bidder's authorized representative (name, address, telephone numbers, fax numbers, e-mail address)	
Attached are copies of the following original documents.	
1. In case of single entity, articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and 4.2.	
2. Authorization to represent the firm or JV named in above, in accordance with ITB 20.2.	
3. In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1.	
4. In case of a government-owned entity, any additional documents not covered under 1 above required to comply with ITB 4.5.	

Form ELI - 2: JV Information Sheet

Each member of a JV must fill in this form

JV / Specialist Subcontractor Information	
Bidder's legal name	
JV Partner's or Subcontractor's legal name	
JV Partner's or Subcontractor's country of constitution	
JV Partner's or Subcontractor's year of constitution	
JV Partner's or Subcontractor's legal address in country of constitution	
JV Partner's or Subcontractor's authorized representative information (name, address, telephone numbers, fax numbers, e-mail address)	
Attached are copies of the following original documents.	
1. articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and 4.2. 2. Authorization to represent the firm named above, in accordance with ITB 20.2. 3. In the case of government-owned entity, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5.	

Form ELI - 3: Bidder's Running Contracts⁵

Each member of a JV must fill in this form

	Bidder's Running Contracts				
Name of office	Contract Identification no.	Source of Fund*	Date of issuance of Letter of Acceptance	Status of contract**	Date of Issuance of Taking Over Certificate***

* Mention GON funded or DP funded or Other PE (Insert name) funded

** Mention "Yet to sign" if contract is not signed, "Running" if contract has been signed and contract is running and "Substantially completed" if taking over certificate has been issued.

*** Insert date of issuance of taking over certificate if the awarded contract has been substantially completed and taking over certificate has been issued.

⁵:Note Following Procurement of Works contracts shall not be counted for this purpose

a) The works for which tender were invited or contracts accepted before 2078-12-03 B.S (March 17, 2022 A.D).

b) The works for which tender have been invited and contracts accepted after 2078-12-03 B.S (March 17, 2022 A.D) but the work acceptance report has been approved according to Rule 117 of PPR.

c) The works for which tenders were invited or contracts accepted under all types of foreign assistance

Form LIT - 1: Pending Litigation

Each member of a JV must fill in this form

Pending Litigation			
☐ No pending litigation in accordance with Criteria 2.2 of Section III (Evaluation and Qualification Criteria) ☐ Pending litigation in accordance with Criteria 2.2 of Section III (Evaluation and Qualification Criteria)			
Year	Matter in Dispute	Value of Pending Claim in NRS	Value of Pending Claim as a Percentage on Net Worth

Form FIN - 1: Financial Situation

Each Bidder or member of a JV must fill in this form

Financial Data for Previous 3 Years [in NRS]		
Year 1 :	Year 2 :	Year 3 :

Information from Balance Sheet

Total Assets			
Total Liabilities			
Net Worth			
Current Assets			
Current Liabilities			

Information from Income Statement

Total Revenues			
Profit Before Tax			
Profit After Tax			
○ Attached are copies of financial statements (balance sheets including all related notes, and income statements) for the last three or above years, as indicated above, complying with the following conditions. ○ All such documents reflect the financial situation of the Bidder or partner to a JV, and not sister or parent companies. ○ Historic financial statements must be audited by a certified auditor. ○ Historic financial statements must be complete, including all notes to the financial statements. ○ Historic financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).			

Form FIN - 2: Average Annual Construction Turnover

Each Bidder or member of a JV must fill in this form

The information supplied should be the Annual Turnover of the Bidder or each member of a JV in terms of the amounts billed to clients for each year for work in progress or completed to NRs at the end of the period reported.

Annual Turnover Data for the Last 10 Years (Construction only)	
Year	Amount Currency

- **Average Annual Construction Turnover
(Best three years within the last 10 years)**

--

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

Form FIN - 3: Financial Resources

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

Financial Resources		
No.	Source of financing	Amount (in NRS)
1		
2		
3		

Form FIN – 4: Bid Capacity

Each Bidder or member of a JV must fill in this form

$$\text{Bid Capacity} = [(5 \times A) - B]$$

A = Average Annual Turnover of best three years out of last ten fiscal years.

B = Annual Value of the existing commitments and works (ongoing) to be completed, calculated from FIN-4.

SN	Name of Bidder	Pan No.	A, in Million	B, in Million	Bid Capacity, in Million
1					
2					
3					

Total Bid Capacity :

Signature of Bidder





Handwritten signature in blue ink.

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

Form FIN- 5: Current Contract Commitments / Works in Progress

Bidders and each partner 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.

Current Contract Commitments (For Calculation of B with reference of FIN-3)									
No.	Name of Contract	Name of the Contractor/s	Employer's Contact Address, Tel, Fax	Contract Share in % (a)	Contract Amount in Millions (b)	Contract Date(yyyy-mm) (c)	Initial or Revised Contract Duration (months) (d)	Value of outstanding works [In Millions, NRS] [#] (e)	Estimated Time in Month to Complete the outstanding works (f) = (c) + (d) – Date of Invitation of Bid (f)
1									
2									
3									
4									

Signature of Bidder

[#] The Outstanding Works means Contract Price (excluding Vat) minus Work Evaluated by Employer till the reference date. Bidder shall have to submit the relevant documentary evidence to substantiate the facts/figures.

Note 1: “B” shall be calculated as : $B = \sum \left[\frac{(e) \times (a)}{(f)} \right] \times 12$, If (f) is less than 12, then value of (f) shall be taken as 12.

Note 2: If Initial or Revised Contract Date is run out with respect to Date of Invitation of Bid, the Estimated Time in Month to Complete the outstanding works shall be taken equal to 12 months.



Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

Form EXP - 1: General Construction Experience

Each Bidder or member of a JV must fill in this form.

General Construction Experience				
Starting Month Year	Ending Month Year	Year	Contract Identification and Name and Address of Employer Brief Description of the Works Executed by the Bidder	Role of Bidder

Form EXP - 2(a): Specific Construction Experience

Fill up one (1) form per contract.

Contract of Similar Size and Nature			
Contract No..... of.....	Contract Identification		
Award Date		Completion Date	
Role in Contract	☐ Contractor	☐ Management Contractor	☐ Subcontractor
Total Contract Amount	☐ NRS		
If Partner in a JV or subcontractor, specify participation of total contract amount	Percent of Total	Amount	
Employer's Name Address Telephone/Fax Number E-mail			
Description of the similarity in accordance with Criteria 2.4.2 (a) of Section III			
Participation as Prime contractor, management contractor, or subcontractor, in at least One (1) Contract within the last ten (10) years, with a value of at least NRs 93,038,000.00 that have been successfully or are substantially completed and that are similar to the proposed works. The similarity shall be based on the physical size, complexity, methods, technology or other characteristics as described in Section VI, Works Requirements. <i>The similarity here shall means Design, Supply, Delivery and Installation, Testing, Commissioning of 33/11kV.</i>			

Form EXP - 2(b): Specific Construction Experience in Key Activities

Fill up one (1) form per contract.

Contract of Similar Size and Nature			
Contract No..... of.....	Contract Identification		
Award Date		Completion Date	
Role in Contract	☐ Contractor	☐ Management Contractor	☐ Subcontractor
Total Contract Amount	☐ NRS		
If Partner in a JV or subcontractor, specify participation of total contract amount	Percent of Total	Amount	
Employer's Name Address Telephone/Fax Number E-mail			
Description of the similarity in accordance with Criteria 2.4.2 (a) of Section III			
For the above or other contracts executed during the period stipulated in 2.4.2(a) above, a minimum construction experience in the following key activities: <u>1) Supply, Delivery and Installation, Testing, Commissioning of one 33/11kV or higher voltage Substation</u>			

Manufacturer's Authorization

Date: (insert date (as day, month and year) of
bid submission)

ICB No.: [insert number of bidding process]

To: (insert complete name of the employer)

WHEREAS

We [insert complete name of the manufacturer or manufacturer's authorized agent], who are official manufacture agent authorized by the Manufacturer of [insert type of goods manufactured), having factories at [insert full address of manufacturer's factories), do hereby authorize [insert complete name of the bidder] to submit a bid the purpose of which is to provide the following goods, manufactured by us [insert name and/or brief description of the goods), and to subsequently negotiate and sign the Contract.

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

Signed: [insert signature(s) of authorized representative(s) of the manufacturer]

Name: [insert complete name(s) of authorized representative(s) of the manufacturer)

Title: [insert title]

Duly authorized to sign this Authorization on behalf of [insert complete name of the manufacturer]

Dated on day of, (insert date of signing)

-Note-

The bidder shall require the manufacturer to fill out this form in accordance with the instructions indicated. This letter of authorization should be signed by a person with the proper authority to sign documents that are binding on the manufacturer. The bidder shall include it in its bid, if so, indicated in the BDS.



Functional Guarantees of the Proposed Facilities

A. Power Transformers

The Bidder shall furnish guaranteed No Load, Full Load and the Cooler Fan Loss (if applicable) value at rated full load capacity of the Transformer along with the Technical Bid for all rating of the Power Transformers. Failure to submit the loss figures may result in rejection of the Bid.

(i) 33/11 kV, 6/8 MVA Power Transformer

S. No.	Functional Guarantee	Unit	Functional Guarantee Value Offered by the Bidder
1	Value of No Load Losses	kW	
2	Value of Load Losses	kW	
3	Loss associated with cooling fan load	kW	
	Total Losses		

Section V - Eligible Countries

For the purpose of ITB 4.2: “**Nepal**”; and

For the purpose of Country of Origin ITB 5.1 and GCC 79.2: “**all Countries**”

Part II: REQUIREMENTS



Table of Contents

Section VI: Works Requirements (WRQ)	
Scope of Work.....	Error! Bookmark not defined.
Specifications	Error! Bookmark not defined.
<i>Notes on the Specifications</i>	<i>Error! Bookmark not defined.</i>
<i>Sample Clause: Equivalency of Standards and Codes</i>	<i>Error! Bookmark not defined.</i>
Drawings.....	334
Supplementary Information	Error! Bookmark not defined.
Personal Requirements.....	85
Equipment Requirements.....	86
Section VII: Bill of Quantities	343
<i>Notes for Unit Rate Contracts:</i>	346
<i>Preamble of Bill of Quantities</i>	347
<i>A. General</i>	347
<i>B. Day work Schedule</i>	348
<i>Provisional Sums</i>	349
Bill of Quantities	Error! Bookmark not defined.

VI: Works Requirements

PROJECT SPECIFICATION REQUIREMENT (PSR)

1. Description of the Project:

1.1 General:

The Project include "**Design, Supply, Delivery, Installation/Erection, Testing and commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District.**"

The scope includes Design, Supply, Delivery, Installation/Erection, Testing and commissioning/Charging of 33/11 kV, 6/8 MVA Power Transformers, 33 kV & 11 kV Vacuum Circuit Breakers, Disconnecting switches, Lightning Arrestors, HT/LT Power Cables, Control Cables, Control & Relay Panels and other 33/11 kV Substation switchgears with related civil construction as required provided in the end of this section. The scope of supply of plants and related services under this Project, but not limited to, are given below:

1.2 This Tender Document covers the construction of substation works and all the necessary civil, structural, mechanical and electrical works, including the design, supply, manufacturing, delivery, erection, construction, commissioning, trial operation and test of the equipment, works and materials as specified or referred to in the technical specifications of this Tender Document.

1.3 If any discrepancies in the specifications and drawing are found, shall be discussed and rectified before or at the time of final approval of drawings.

1.4 The bidders are requested to visit site(s) at its own to get the general idea about substation location and quote the price accordingly.

1.5 The Contractor shall have adequate manpower to execute the works at site(s) to complete the work within the scheduled time.

1.5.1 Equipment and Materials:

The Contractor to his designated store area shall deliver all equipment and materials. Such materials shall be delivered, unloaded and placed in stores in an acceptable manner and approved by the Employer or his authorized representative.

1.5.2 Erection:

When a substation area has been completed and accepted by the Employer, the Contractor will make an inventory of the assemblies erected, and submit it to the Employer for approval and final payment.

Before the Taking-Over of the works, the Contractor shall clean up all areas in which he has worked, place all unused materials in the designated stores and settle any claims, which may have resulted from his work and occupancy of the area. He shall then remove all equipment, vehicles, manpower and

facilities, which, he has brought in except those which may be specifically exempt by the Employer.

1.6 Contract Scope:

This section outlines all major work to be carried out by the Contractor all the new and existing substations. All engineering design and materials shall be subject to the Employer/Employer's Representative approval.

2. Special Requirements of the Project

2.1 General

2.1.1 This specification covers the general requirements for design, manufacture, assembly, shop test, delivery, field, test, dismantling and installation commissioning of works for substation equipment.

2.1.2 Any deviation from this specification or the Technical Specification shall be clearly stated with reasons.

2.2 Conditions of Service

2.2.1 All plant and equipment supplied under this Contract shall be suitable for the following system and site conditions.

(a)	System electrical parameters		
(1)	System voltage	33kV and 11kV (2)	
	Number of phase	3	
(3)	Frequency	50Hz	
(b)	Climatic conditions		
(1)	Ambient temperature		
-	Maximum	37 deg. C	
-	Minimum	0 deg. C	
-	Annual average	25 deg. C	
(2)	Wind velocity		
-	Maximum	34.4m/sec	
(3)	Relative humidity		
-	Maximum	100%	
-	Minimum	20%	

(4)	Monsoon season	June-August
(5)	Precipitation	
-	Maximum	1,000 mm/month
-	Minimum	Zero/month
(c)	Altitude of site	2030m from sea level
(d)	Seismic force	0.15G
(e)	Isokeraunic level	5

The information in this Sub-Clause is given solely for the general assistance of Bidders and no responsibility for it will be accepted nor will any claim based on this article be considered. The Bidder is advised to survey the Sites covered under this Contract to acquaint himself with site conditions.

2.2.2 The Contractor shall be responsible for surveying, borings, geologic and subsoil conditions for all foundations, and for the precise location of each substation in the project.

2.2.3 All necessary soil tests to determine the earth resistivity, the design of the ground grid and all foundations shall be performed by the Contractor at each substation site.

2.2.4 The Contractor shall locate, and record on the construction drawings, all interfacing utility lines or other obstructions.

Damage to existing line equipment and structures shall be repaired by the Contractor at his expense.

2.3 Codes and Standards

2.3.1 All plants and equipment supplied under this Contract shall conform to or be of higher quality than the latest applicable standard as listed in the following:

IEC	- International Electrotechnical Commission
ANSI	- American National Standard Institute
BS	- British Standard
NEMA	- National Electrical Manufacturers Association IEEE - Institute of Electrical and Electronics Engineers

ASTM

- American Society of Testing and Materials ASME
- American Society of Mechanical Engineers IPCEA
- Insulated Power Cable Engineers Association

ISO	- International Organization for Standardization
ASCE	- American Society of Civil Engineers
ACI	- American Concrete Institute
NEC	- National Electrical Code (ANSI CI)
ISI	- Indian Standard Institute

2.3.2 If the Specifications contained in this Contract conflict in any way with any of the reference standards, the Specifications shall take precedence. If there are conflicts between different specified reference standards covering the same material or equipment, the standard which will provided the highest quality and most suitable application as determined by the Employer/Employer's Representative shall prevail.

2.3.3 References to standards or to equipment of a particular manufacturer shall be regarded as followed by the words “or equivalent” except as otherwise noted. The Contractor may propose alternative standards, or equipment, which shall be equal to those, specified. If the Contractor for any reason proposes alternatives to or deviations from the above standards, or desires to use equipment not covered by the above standards, the Contractor shall state the exact nature of the change, the reason for making the change, and shall submit, for the approval, relevant specifications of the equipment in the original language, and in case that these specifications are written in language other than English, the English version shall be attached and shall govern. The decision of the Employer/Employer's Representative in the matter of equality will be final.

2.4 Scope of Works

2.4.1 The scope of works under this Contract shall include manufacture, shop test, delivery to each substation site in the Contract, receiving, assembly, erection, installation of the transformer, equipments field test, all civil work, and commissioning of all equipment necessary for complete operation of each substation. The work includes but is not limited to the following:

(a) Lattice type steel structures for transmission line incoming/outgoing, supporting structures, all nuts, bolts and miscellaneous steel required for mounting and installation of all the equipment and materials furnished.

Support structure for 33 kV Air Break (Disconnecting switch) shall be the part of the switch itself. That is to say extra payment shall not be made.

Support structure of 33kV vacuum circuit breaker (VCB) shall also be the part of the circuit breaker. No extra payment shall be made for this.

Steel structure excluding above items shall cover under heading of galvanized steel structure for gantry and support as mentioned in the price schedule. Any specifically mentioned items shall not come under this steel structure.

(b) Outdoor type 33kV VCB, switchgears including circuit breakers, disconnecting switches, power fuse, instrument transformers, lighting arresters, insulators and bus materials complete with all fittings and connectors.

(c) Cables, wires, ground rods, fittings and connectors for the entire, grounding and static protection systems for each substation.

(d) Power transformers, 12kV VCB switchgears, station service transformers, and panel boards for substation AC/DC supply.

(e) Maintenance free Batteries and appropriate battery chargers for 110V DC supply system.

(f) All panels for control, metering, relaying, alarms, recording of events, etc. required for operation and protection of the entire substation.

(g) Cables and wires complete with terminal lugs and accessories for control, metering, relaying, alarms, carrier, and communication. AC and DC station power and lighting, and any other cables and wires required to interconnect all equipment of the entire substations.

(j) All civil works including, foundation and cable duct..

2.4.2 The Contractor shall submit detailed drawings, instruction and maintenance books, and spare parts lists with recommended stock quantities for the equipment furnished, prepare and submit detailed engineering, design and construction drawings pertaining to all mechanical and electrical equipment and installations in each substation. The drawings to be furnished by the Contractor for each individual substation shall include, but not be limited to the following:

- (a) Single line and three-line diagram for existing substation and proposed up-gradation
- (b) General layout of substation and property plan layout
- (c) 33kV electrical layout and elevations, plans and details
- (d) Structural erection and fabrication drawings
- (e) Substation grounding calculation, plans, elevations and details
- (f) Foundation layouts, plans and elevations indicating top of foundations, details for anchor bolt installation, including all data required for civil works.
- (g) Cable trench, duct and conduit layout plan, elevation and details
- (h) One line diagram for AC and DC station service power supply
- (I) Substation lighting and convenience outlet plan, elevation, and details
- (j) Substation control building electrical equipment layout, plan, elevation and details, including cable trench, cable tray, wire gutters, conduits, and specifying location and installation details for equipment furnished.
- (k) Detailed material list for each substation
- (m) Elementary AC and DC diagram for control, metering, relaying, communication, alarm etc., required to describe in detail the operation of all systems in each substation. Wire numbers and terminal numbers for each device shall be clearly marked on all AC and DC elementary and schematic diagram.
- (n) Interconnection diagram for all substation equipment. AC and DC station service equipment and all building equipment.
- (o) Detailed cable schedule list and cable summary, specifying cable identification number, routing and length of each cable for each substation.
- (p) Switchgear and panel board front and rear elevation drawings showing dimensions and identification of each device and complete nameplate schedule.

- (q) Calculation and coordination of protection relays.
- (r) Instruction books, spare parts lists, material lists and any other documents pertaining to each substation and required for construction, operation, maintenance and repair.

All the instructions, manuals and relevant information in the drawings must be in English.

Unless otherwise specifically mentioned, the drawings and data pertaining to the Works shall be according to this clause.

a) General

All drawings shall be prepared in AutoCAD and the Contractor shall submit 3 sets of such electronic drawing files in Compact Disc to the Employer and the Consultant.

- b) The Contractor shall submit the drawings and data to the Employer for approval in the following manner and designated deadlines.

For supply of equipment and/or installation work

<i>Item</i>	<i>No. of Copies</i>	<i>Deadline & Remarks</i>
Proposed work program	3	Within 30 days from the date of signing of Contract.
Principal equipment drawings for approval	3	Within 90 days from the date of signing of Contract.
Principal installation drawings for approval	3	Within 120 days from the date of signing of Contract.
Revised drawings for approval	3	Within 30 days after receiving drawing for revision.
Final drawings with reproducible copies	5	Within 30 days after receiving approval.
AutoCAD files of Final Drawings in Compact Disc	2	Within 30 days after receiving approval.
Schedule of manufacturing and transportation	2	Within 30 days from the date of signing of Contract.
Plan for shop tests	2	Not less than 45 days before testing
Results of shop tests for approval	4	Upon completion of tests
Records of shop tests	4	Upon approval of results of shop tests
Plan for field-tests	2	Not less than 15 days before testing
Report for field tests	4	Within 7 days after completion of each test

As-built drawings	5	Within 30 days after completion of installation work
AutoCad file of as-built drawings	3	Within 30 days after completion of installation work
Instruction manuals and drawings with reproducible copies for installation	5	30 days after shipment of Equipment

For Civil Works

Item	No. of Copies	Deadline & Remarks
Detail construction schedule & method	3	Within 30 days from the date of signing of Contract
Drawing for approval (principal drawings for construction)	3	Within 90 days from the date of signing of Contract.
Revised drawings for approval	3	Within 15 days after receiving drawings for revision
AutoCad file of approved drawings in Compact Disc	2	Within 15 days after receiving drawings for revision
Reports of Field Tests	4	Within 7 days after completion of each test
As-built drawings	5	Within 30 days after completion of construction works
AutoCad files of as-built drawings in Compact Disc	3	Within 30 days after completion of construction works

Others

Item	No. of Copies	Deadline & Remarks
Monthly Progress Reports with photographs	3	By 10th of following month
Packing list (copy)	5	At each shipment
Invoice (copy)	5	At each shipment
Bill of lading (copy)	5	At each shipment
Certificate of origin (copy)	1	At each shipment

The Employer will approve each drawing within thirty-five (35) days after receipt at his office. One print of each of the drawings submitted for approval will be returned by the Employer or Employer's Representative, marked either "APPROVED", "APPROVED EXCEPT AS NOTED", or "RETURNED FOR CORRECTION".

(a) The notations "APPROVED", or "APPROVED EXCEPT AS NOTED" will authorize the Contractor to proceed with the manufacturing drawings, subject to the corrections, if any indicated thereon. The notation "RETURNED FOR CORRECTION" shall require the Contractor to make the necessary revisions on the drawings and submit for approval within thirty-five (35) days in the same manner as before. Approval of the Contractor's drawings shall not in any way relieve the Contractor of any part of his obligation to meet all the requirements of the Contract or of the responsibility for the correction of the drawings.

(b) Reproducible: Reproducible of all final approved drawings shall be made on CDs.

(c) All final as-built drawings shall be supplied in CD-ROMs (three sets).

2.4.3 The Contractor shall provide spare parts and tools for each substation as specified in this specification.

2.4.4 Furnish qualified supervision and construction personnel for the installation, testing, commissioning and final system testing and checking out of the equipment listed above and detailed in the Schedule of Materials. The work shall be performed in close cooperation and collaboration with the Employer/Employer's Representative.

2.4.5 Coordination of the substation work with the installation of others shall be the responsibility of the Contractor. The Employer will furnish the information needed to coordinate the substation work with the other work.

2.5 Assistance by the Employer

The Employer will give assistance to the Contractor as much as possible in the following; this however will be without any obligations, legal or otherwise.

(a) Facilitating access to all locations involved in carrying out the works.

(b) General guidance to the Contractor for all negotiations with the Authorities in Nepal.

2.6 Variation in Quantities of Work

The Quantities listed in the Prices Schedules represent the estimated quantities for tender purpose only. The Contractor agrees to make no claim for anticipated profits or for alleged losses because of any difference between the quantities actually furnished and installed and the estimated quantities as indicated in these Tender Documents.

2.7 Time Schedule and Progress Report

2.7.1 Within 30 days from the date of signing of the Contract, the Contractor shall submit to the Employer/Employer's Representative a time schedule and progress chart covering work to be done at each manufacturing plant and installation at site. The Contractor shall show the several salient features of the work.

2.7.2 The proposed project period is as specified in the General Condition of Contract. Failure to meet these dates may result the Employer to enforce the provisions of "Liquidated Damages" to the Contractor. The Bidder shall submit the project schedule prepared by PERT/CPM with the Tender.

2.7.3 The Contractor shall submit the actual progress and the estimated earnings at the end of the month. Three (3) number of copies shall be furnished to the Employer/Employer's Representative with the monthly report.

2.7.4 The time schedule will be subject to review by the Employer/Employer's Representative for compliance with the Contract Documents and shall be revised if necessary by the Contractor to bring it into such compliance. The schedule shall be reviewed and revised if necessary at intervals not to exceed four weeks. In addition, the Employer/Employer's Representative shall be advised promptly of any proposed changes in the schedule.

2.7.5 The Contractor shall prepare and submit monthly to the Employer/Employer's Representative a report covering the progress on design, manufacturing and installation work at the Site during the month of record. The reports shall be accompanied by suitable illustrations and photographs and by copies or working schedules as necessary to effectively evaluated and document the progress of the work. The reports shall cover at least the following activities:

- (a) Manufacturing status of equipment at each factory
- (b) Shipping status
- (c) Arrival of equipment and schedule for arrival of other required equipment

- (d) Installation of Contractor's equipment at the Site
- (e) Performance record of critical items of Contractor's equipment
- (f) Quantitative progress on work at the Site
- (g) Scheduled progress for work at the Site

- (h) Description of conditions encountered that have affected the progress of the Works adversely and of action taken to alleviate the conditions and regain the anticipated progress.
- (I) Description of matters, which the Contractor anticipates, will require contract interpretation, engineering decisions, or policy determinations.
- (j) Numbers of employees in various categories at the Site and projected numbers for the following three months.
- (k) Schedule showing the progress of planned and actual for each salient activities of the work.

The Contractor shall submit the report by end of the following month.

2.7.6 The employer has provided a time schedule for the execution of the work with this document. The contractor may revise the schedule of different items but the total completion time shall remain the same.

2.8 Drawings and Data

2.8.1 The Contractor shall prepare and furnish to the Employer/Employer's Representative such drawings, calculations, and data on materials and equipment (hereinafter in this provision called data) as are required for the proper control and completion of the work, including but not limited to those drawings, data and calculations specifically required elsewhere in the Technical Specifications.

2.8.2 The Metric System shall be used and notations shall be in English. Drawings, calculations, and data shall be furnished as specified. All drawings and data will be subject to review by the Employer/Employer's Representative conformity with the Technical Specifications and Contract Drawings and upon meeting review requirements shall become Employer.

2.8.3 Within 30 days from the date of signing of the Contract, the Contractor shall prepare and furnish to the Employer/Employer's Representative a schedule for submission of all drawings and data. Each drawing to be submitted for the work of the Contract shall be listed on the schedule, and the schedule shall contain separate columns for scheduled submitted dates and actual submittal dates. The schedule will be reviewed by the Employer/Employer's Representative and the Contractor shall correct any defects noted therein. The schedule shall at all times present a complete plan for orderly submission of such drawings and data and shall be updated and resubmitted monthly showing actual submittal dates and revised scheduling. The Contractor shall promptly notify the Employer/Employer's Representative of any occurrence requiring substantial revision of the schedule giving a detailed explanation of the cause of the revision. Revised schedules will be revised and corrected in the same manner as the original schedule.

2.8.4 Neither the review nor lack of review of any drawings, calculation or data shall waive any of the specification or Contract drawings, or responsibility for correctness of the drawings, calculations or data and defective work, materials, and equipment may be rejected notwithstanding conformance with drawings, calculations and data reviewed by the Employer/Employer's Representative. The Employer/Employer's Representative shall have the right to require the Contractor to make any changes in the design which may be necessary, to make the apparatus conform to the requirements and intent of the specifications, with no additional cost to the Employer.

2.8.5 Any drawing changed by the Contractor during the development of his design after review by the Employer/Employer's Representative shall be submitted for approval.

2.9 Quality Control

2.9.1 The Contractor shall provide and maintain a Quality Control Plan (QCP) to ensure compliance with quality standards of the Technical specification, the Contractor shall furnish to the Employer/Employer's Representative six (6) copies of his complete quality control procedures, manual, and a description of the quality control organization.

2.9.2 The Employer/Employer's Representative will monitor the Contractor's methods, procedures and processes for compliance with the QAP and the quality standards of these specifications. Failure of the Contractor to effectively maintain the quality control program throughout all phases of the work will be considered a failure to prosecute the work with the diligence required by the Contract Documents.

2.10 Painting

2.10.1 All sheet steel work shall be phosphated in accordance with the following procedure and in accordance with BS 2569 and BS 5493.

2.10.2 Oil, grease, dirt shall be thoroughly removed by emulsion cleaning.

2.10.3 Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

2.10.4 After phosphating, through rinsing shall be carried out with clean water, followed by final rinsing with dilute dichromate solution and even drying.

2.10.5 The phosphate coating shall be sealed by the application of two coats of stoving type zinc chromate primer. The first coat may be 'flash dried' while the second coat shall be stoved.

2.10.6 After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. Touch up shall be applied after completion of tests. All panels should have same color.

The color for the finishing paint shall be approved by the Employer/Employer's Representative.

2.10.7 The final finished thickness of paint film on steel shall not be less than 100 microns.

2.10.8 Finished painted surface of panels shall present at aesthetically pleasing appearance free from runs and drips.

2.10.9 A small quantity of finishing paint shall be supplied for minor touching up required at site after the installation of the panels.

2.11 Packing and Shipment

2.11.1 The Contractor shall prepare all materials and equipment for shipment in such manner as to protect them from damage in transit and in storage prior to installation. Materials that might otherwise be lost shall be boxed or wired in bundles.

2.11.2 All finished surfaces or ferrous metals, including screw threads that will be exposed during shipment or while awaiting installation shall be cleaned and shall be given a heavy uniform coating of rust-preventive compound devices subject to damage shall be suitably wrapped or otherwise protected from damage.

2.11.3 Each complete field assembly shall be given an identification number or letter, and each part of each field assembly which is not permanently connected in shop assembly shall be legibly marked. Except on bolts and other small parts, all such marks shall be made with oil-resistant paints. Diagrams showing all such markings shall be supplied. Each place of subassembly separately packed for shipment shall be labeled or tagged with the specification number and the mark number of such piece or the numbers of the parts grouped in such subassembly, or contained in the package. The individual substation name shall be clearly and legibly marked on each package and crate.

2.11.4 The spare parts shall be packed separately from other articles. Packages of spare parts shall be clearly identified and shall be accompanied by a list of contents, which set forth directions for storing.

2.11.5 The Contractor shall prepare a packing list for each and every shipment made. In the case of several packages included in a single shipment, more than one package may be included on one packing list, providing all required information is shown for each package.

The following information shall be provided for each package:

- (a) Description of package, i.e. box, crate, drum, bundle etc.
- (b) Package number

- (c) General description of contents corresponding to the invoice
- (d) Equipment number where applicable
- (e) Gross, tare and net weights in kilograms

2.11.6 Painting of Control Building :

It shall cover the followings:

- a. Two coat of cement paint shall be inside and outside of the control building. The color choice shall be of the owner.

- b. The paint shall be from reputed manufacturer. The Contractor shall have to take the written consent from the owner for the maker of the paint to be used; failing to do so may lead to nonpayment. Please note that thinner shall not be allowed for diluting the metal or wood prima, enamel paint i.e. paint shall be used without diluted.
- c. One coat of wooden prima and two coats of enamel point shall be used for wooden parts of window and door. Same shall hold for grill of window.
- d. Repairing of patches inside and outside of control building. The ratio of mortar shall be 1:4.
- e. Replacement of broken glass, wooden panel and damaged hinges and locks etc.
- f. The repairing of the door, window shall be in such way when closed there shall not be free flow of air. That is to say, the repairing shall be suitable for air conditioning.

2.12 Tools and Appliances

The Bidder shall supply complete, new and unused sets of all special tools or gages, which will be required for normal operation and maintenance. The Bidder shall furnish the list of tools and appliances in the Tender Document. To the Greatest extent possible, the tools for each specific operation shall be stored in a single, locked, portable, steel box suitably and clearly marked for convenient identification. These shall be the part of equipment.

2.13 Spare Parts

2.13.1 The Bidder shall propose recommended spare parts required for three years maintenance in addition to the spare parts specified in the price schedule of Tender Document and shall include a price list of these parts in a separate sheet of paper. The price of such spare parts proposed by the bidder shall not be taken into account for financial evaluation. Sufficient information shall be provided to permit the Employer/Employer's Representative to estimate spare parts requirements.

2.13.2 All spare parts supplied under the Contract shall be strictly interchangeable with the parts for which they are intended to be replaced and shall be treated and packed for long storage under the climatic conditions prevailing at the site. Each spare part shall be clearly marked or labeled on the outside of its packing with its description and purpose, and when more than one spare part is packed in a single case or other container, a general description of its contents is to be shown on the outside of such cases or container and a detailed list enclosed inside. All cases, containers and other packages must be suitably marked and numbered for purpose of identification.

2.13.3 All cases, containers or other packages are liable to be opened at the site for such examinations as

the Employer/Employer's Representative may consider necessary and all such opening and subsequent repacking shall be at the expense of the Contractor.

2.13.4 All spare parts must be delivered to Site in advance of the trial operation. The Contractor shall ultimately prepare and deliver five (5) copies of the final consolidated spare parts list, arranged specifications-wise.

2.13.5 It shall be in the interest of the Contractor to organize the delivery and systematic storage of spare parts before the trial operation to obviate post erection difficulties and delays. Any spare part consumed by the Contractor before Performance Certificate shall be replaced without any cost to the Employer.

2.14 Technical Requirements

2.14.1 Electrical auxiliary power supply

The electrical auxiliary and control power source shall be as follows:

- (a) AC auxiliary power source
 - 3 phase, 4-wire, 50Hz. 400/230V
 - 1 phase, 50Hz, 230V
- (b) DC control power source: 110V

2.14.2 Wiring

The equipment to be provided as part of this Contract shall be fully wired in accordance with the following general requirement.

- (a) All wiring shall be carried out in general purpose 600 volt grade PVC copper wire complying with the requirements of IEC. The wire core size shall not be less than 2.5sqmm. All wire cores shall be multi stranded and flexible.
- (b) Wires shall be neatly bunched and adequately supported so as to prevent sagging and strain on termination.
- (c) All inter panel wiring between panels that directly adjoin one another shall be made through suitable holes in the common panel side sheets. All inter panel wiring shall start and terminate on terminal blocks; direct wiring between other items of equipment will not be acceptable.
- (d) Joints or splices in panel and inter panel wiring not be acceptable. (e) The wiring of panels, cubicles or kiosks shall be identical.
- (f) All wire termination shall be made with compression type connectors. Wires shall not be spliced or tapped between terminal points.

- (g) Not more than two wires shall be connected to any terminal at each end. If necessary, a number of terminals shall be jumpered together to provide additional wiring points.
- (h) Wiring leads and cable cores shall be permanently marked at both ends with an approved type of marking device having black letters and numbers impressed on a white background.

2.14.3 Terminal Blocks

- (a) Multiway terminal blocks complete with screws, nuts, washers and marking strips for terminal identification shall be furnished for terminating the internal wiring and outgoing cables.
- (b) Control terminals shall be washers head screw type, each suitable for connection of at least two numbers copper conductor cables of requisite cross-section at each end through compression type (solderless) lugs. Screw type terminals with screw directly impinging on conductor or any other of terminal, which does not accept compression type lugs, are not acceptable. The successful Bidder shall have to take prior approval of the terminals to be used in the block from the Employer/Employer's Representative.
- (c) Each terminal shall be marked with designations obtained from schematic diagrams.

At least 20% spare terminals shall be provided in the terminal blocks.

2.14.4 Nameplate

- (a) Nameplates or rating plates shall be stainless steel and shall be engraved in English language. Instruction plates, warning signs and any marking whatever on the equipment and parts and accessories thereof shall be in English.
- (b) The switch handles shall be carved with the function number or word colored in white.
- (c) The details of the matters to be shown on the nameplates, etc. shall be indicated in the drawings for approval.

2.14.5 Switchyard Surface Cleaning:

The scope of works under this heading comes as following:

1. Taking out grass from its root, So that the chances of sprouting are minimized. The realignment and leveling of existing switchyard gravel.

2.14.6 Surface Dressing with Crushed Stone:

It covers the followings:

1. Filling up by gravel in the patch
2. Filling up the in the switchyard if it not.
3. Crushed stone to be used shall be 40 mm size and depth of 15 cm.

2.14.7 Switchyard Painting:

It shall cover the followings:

- a. One coat of red oxide point and two coat of Aluminum point
- b. The point shall be from reputed manufacturer. The contractor shall have to take the prior written acceptance from the owner for the manufacturer of the point.
- c. Thinner shall not be used.
- d. Painting of transformer and equipment shall be by spray gun.
- e. Special care shall be taken to avoid spray on bushing and name plate
- f. Painting shall be done on the followings:
- g. Gantry / Steel Structure, Transformer and other equipment's.
- h. Galvanized steel structure shall not be pointed.

2.14.8. Repairing of Cable Trench (outdoor):

It shall cover the followings:

- a. Repairing / replacement of cable trench slab.
- b. Repairing of any damaged or likely to be damaged part of cable trench.
- c. Repairing of patch works.
- d. Repairing / replacement of cable support tray or angle etc.
- e. The repairing shall look line new one.

2.14.9 Repairing of Cable Trench (Indoor):

- a. Same as in item No 2.14.8.
- b. If there is no cover over the cable trench, it shall have to be supplied/constructed by the contractor

3 Construction and Installation Works:

It shall include construction, erection, assembly, installation, testing and commission of the equipment and steel structure. After the construction and installation works the equipment shall run trouble free and smooth.

3.1 Foundation Works:

It shall include the following:

- a. Foundation works shall be per the specification provided in Section VII

3.2 Clamp:

Clamp to be used for fixing the channel to the pole shall be made of mild steel strip of 500mm x 5 mm section. This shall be hot dip galvanized. The zinc costing shall be 610 gram per square meter.

3.3 Trolley of V.C.B.:

This shall be the trolley of V.C.B. cubicle, complete with vacuum interrupter etc. It shall be purchased as spare.

3.4 Galvanization:

All the steel structures used as support to the equipments, gantry and column shall be galvanized through the process as prescribed in IS/ IEC standard but the zinc coating shall be 610 gram per square meter (85 micron).

3.5 Lightning Mast

The Lightning Mast shall be designed, supplied and installed as per the standard practices and as per the site conditions. The design details of the Lightning Mast shall be submitted to the owner for approval.

3.6 Minor Items and Works:

While reinforcing / constructing substations under this contract, minor items like shifting of switchyard lighting poles, shifting of gantry structure, dismantling of existing wall/ fence, equipment shifting and relocating the switch yard steel fencing, interconnection of new and old earthing system, shifting of electrical equipment from one place to another inside and outside the switch yard or in control room etc. which are not mentioned in the price schedule shall have to be done for completing the substations electrically and mechanically sound. These items and works may include labour and materials. It is not practical to mention such minor items specifically in the price schedule. The cost of such items and works shall be included and spread up in the different items of construction and installation works as mentioned in the price schedule. No extra payment shall be made to the contractor for such minor items and works. So the bidders are requested to send an expert to each substation to assess the requirements of such items and works for completing the substation technically sound and to submit the bid accordingly.

4 Environmental Mitigation Measures

4.1 Physical Environment

The following mitigation measures shall be undertaken to reduce the adverse impacts on the physical environment during construction of the substation.

(i) Changes in land use and landscape: The construction activities will be planned properly. The construction material will be stored at the designated places and the haphazard dumping of the construction spoils will be strictly prohibited. Discharge of cement slurry, garbage and other solid wastes generated by the construction activities and workforce will be avoided where possible.

(ii) Disposal of the construction spoils: The excavated material will not be left haphazardly. It will be leveled on the ground. Further, the disposal material of substation will be carried out within the acquired land for substation.

(iii) Stockpiling of the construction materials: The Contractor will have to negotiate with the owner of the property for the use of their premises even if it is for the short period.

(iv) Nuisance to the nearby properties: Although some nuisances may be unavoidable, the Contractor will have to minimize such nuisance. The Contractor will have to work in close-coordination with the local community while working in the settlement areas.

(v) Impact on the infrastructure: The Contractor shall ensure that there will be no interference with the existing infrastructure including utility facilities during contraction.

(vi) Change in air quality: Though change in water quality is unlikely during construction activity, sprinkling of water shall be carried out by the Contractor at least once a day during dry season.

4.2 Biological Environment

None

4.3 Socio-economic and cultural Environment

In the construction phase following mitigation measures shall be adopted to minimize the impacts:

(i) Loss of farmland and other category of land: Any damage to the farmland by the construction activity will have to be restored and rehabilitated.

(ii) Occupational safety and hazard: The Contractor will provide appropriate training in handling equipment and machinery to the workers and laborers before contraction. All workers employed by the Contractors shall be insured against accident.

(iii) Loss of standing crops: The Contractor shall make compensation for the loss of standing crops due to project activities.

(iv) Employment of project affected people: Priority will be given to the project affected people

while hiring workers and laborers during project construction. Nepal being a signatory to the International Convention against the Child Labor, the Contractor shall not employ child labor in construction.

TECHNICAL SPECIFICATION (Electrical Equipment)

1. POWER TRANSFORMER

General

This specification covers the Supply, assembly, delivery, installation works of 33/11 Kv, 6/8 MVA power transformer and field test of the power transformer complete with all accessories, fittings and auxiliary equipment for efficient and troublefree operation. The scope also includes supply delivery testong installation works of 33 kv, AVR and OLTC panel.

This specification covers the design, manufacture, assembly, shop test, supply & delivery, of the power transformer complete with all accessories, fittings and auxiliary equipment for efficient and trouble-free operation as specified herein under.

The transformer shall conform in all respect to highest standards of engineering, design, workmanship, this specification and the latest revision of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment, is not in full accordance therewith.

The equipment specified in this Section of the Contract shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards. In particular:

IEC 60076 Power transformer

IEC 60137 Insulating bushings for alternating voltages above 1kV

IEC 60156 Insulating liquids- Determination of the breakdown voltage at power frequency– Test method

IEC 60296 Specification for unused mineral insulating oils for transformers and switchgear

IEC 60551 Determination of transformer and reactor sound levels

IEC 60616 Terminal and tapping markings for power transformer

IEC 60722 Guide to the lightning impulse and switching impulse testing of power transformers and reactors

Manufacturer of power transformer shall hold valid ISO 9001 (including design) quality certificate.

Equipment to be furnished:

33/11kV, 6/8 MVA Power Transformer

The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

2. DESIGN REQUIREMENT

- 2.1. The transformers hall be connected to three phase, 50Hz system of 33kVsystems as specified.
- 2.2. The transformer shall be installed outdoor in a hot, humid atmosphere. The transformer shall be oil immersed and designed for the cooling system as specified in Appendices.
- 2.3. The transformer shall be capable of operating continuously at its rated output without exceeding the temperature rise limits as specified in Appendices.

- 2.4. The transformer windings shall be designed to withstand short circuit stresses at its terminal with full voltage maintained behind it for a period as per IEC-60076.
- 2.5. The transformer shall be capable of continuous operation at the rated output under the following conditions:
- a) The voltage varying $\pm 10\%$ of rated voltage
 - b) Frequency varying $\pm 5\%$ of the rated frequency.
- 2.6. The transformer shall be capable of delivering its rated output at any tap position.
- 2.7. The transformer shall be free from annoying hum and vibration when in operation even at 10% higher voltage over the rated voltage. The noise level shall be in accordance with respective IEC standards.
- 2.8. The transformer shall be designed and constructed so as not to cause any undesirable interference in radio or communication circuits.
- 2.9. The transformer shall be designed to take care of third harmonics not to exceed 2% of fundamental frequency.

3. CONSTRUCTION FEATURES

3.1 Tank

The tank shall be of all welded construction and fabricated from sheet steel of adequate thickness. All seams shall be properly welded to withstand requisite impact during short circuit without distortion. All welding shall be stress relieved.

Stiffener of structural steel for general rigidity shall reinforce the tank wall. The tank shall have sufficient strength to withstand without any deformation by mechanical shock during transportation and vacuum filling in the field.

The tank cover shall be bolted on to the tank with weather proof, hot oil resistant, resilient gasket in between for complete oil tightness. If gasket is compressible, metallic stops shall be provided to prevent over compression. Bushings, turrets, cover of access holes and other devices shall be designed to prevent any leakage of water into or oil from the tank. The tank cover shall also be provided with two (2) nos. of grounding pads and connected separately to tank grounding pads.

The transformer tank shall be provided with four sets of bi-directional flanged wheels for rolling the transformer parallel to either direction of centerline on rail. Mounting rails and anti-earthquake device shall also be provided.

All heavy removable parts shall be provided with mount in grails along with eyebolt for ease of handling and necessary lugs and shackles shall be provide to enable the whole transformer to be lifted by a crane or other means. Main holes of sufficient size shall be provided for access to leads, windings, bottom terminals of bushings and taps.

3.2 Core & Coils

The transformer shall be of core type. The core shall be built up with interleaved grade non-aging, low loss, high permeability, grain-oriented, cold rolled silicon steel lamination properly treated for core material. The

coils shall be manufactured from electrolytic copper of suitable grade. They should be properly insulated and stacked.

All insulating material shall be of proven design. Coils shall be so insulated, that impulse and power frequency voltage-stresses are minimum.

Coil assembly shall be suitably supported between adjacent sections by insulating spacers and barriers. Bracing and other insulation used in the assembly of the winding shall be arranged to ensure a free circulation of the oil and to reduce the hot spot of the winding. All leads from the windings to the terminal board and bushings shall be rigidly supported to prevent injury from vibration or short circuit stresses. Guide tube shall be used where practicable.

The core and coil assembly shall be securely fixed in position so that no shifting or deformation occurs during movement of transformer or under short circuit stresses.

The bidder shall offer the CORE for inspection and approval by the purchaser during the manufacturing stage. Bidder's call notice for this purpose shall be accompanied with the following documents, as applicable, as a proof towards use of PRIME CORE MATERIALS.

- i. Invoice of the supplier
- ii. Mill's Test Certificates
- iii. Packing List
- iv Bill of Lading
- v. Bill of Entry certificate by the Customs

Core Materials shall be directly purchased either from the manufacturer or through their accredited marketing organization of repute and not through any agent. However, if the proof provided is considered satisfactory by the Purchaser, the core inspection may be waived.

3.3 Tapping

3.3.1 On-load taps as specified in Appendix shall be provided on the high voltage winding of the transformer.

3.3.2 The transformer shall be capable of operation at rated output at any tap position provided the primary voltage does not vary by more than $\pm 10\%$ of the rated voltage corresponding to the normal tap. Where the new transformer is required to operate in parallel with the existing one, the tap changer shall be similar to the one installed with the existing transformer.

3.3.3 The winding including the tapping arrangement shall be designed to maintain the electromagnetic balance between H.V., L.V. & Tertiary winding at all voltage ratios.

3.4 On-Load Tap Changer

3.4.1 The on-load tap-changer (OLTC) to be equipped on the power transformers and associated control equipment shall be from MR Germany or ABB Sweden or equivalent. However, in case of equivalent make offer, the bidder shall submit the type test report, performance certificate and any other documents substantiating the offered product compatible or at par with above specified make.

3.4.2 The continuous current rating of the tap changer shall be based on connected winding rating and shall have liberal and ample margin. Lower rated tap changers connected in parallel are not acceptable.

3.4.3 The tap changing mechanism shall be located in oil filled compartment separated from the main tank by suitable oil tight barrier. The oil in OLTC compartment shall have its own separate oil preservation system complete with conservator Buchholz relay / oil surge relay, breather, shut-off valves, oil level gauge, gas vent etc.

However, one segregated compartment of the main conservator tank may be utilized for OLTC oil preservation.

3.4.4 The on-load tap changing equipment shall have the provision for mechanical and electrical control from local position and electrical control from remote position. For local mechanical operation, the operating handle shall be brought outside the tank for operation from floor level with provision to lock the handle in each tap position. Remote electrical operation shall have parallel operation mode and AUTO-MANUAL selection at remote location. When selected AUTO, the tap changing gear shall maintain steady voltage within practical limit on the transformer secondary bus from which the reference shall be taken within the range of number of taps provided. It shall not respond to transient variation of voltage due to grid disturbance, or system faults.

The required voltage relay shall not be sensitive to frequency variation and shall be suitable for sensing voltage from the secondary of potential transformer mounted on bus. The secondary of potential transformer shall be 110 V. The Bidder shall furnish detail of tap changing mechanism, wiring and schematic connections.

3.4.5 The tap changer shall be provided with over-current protection in order to prevent the tap-changing operations during a short circuit, which would too greatly stress the contacts of the diverter switch. Three instantaneous and self re set over-current relays shall be provided and the function of protection shall be arranged as follows:

- a. Whenever over current occurs, the control circuit for commanding OLTC motor operation shall be blocked by the normally close contacts of the over current relays.
- b. If during tap change over current occurs, the OLTC motor circuit shall be blocked through the mechanical cam switch, which is close from the very beginning to the very end of every tap change operation and the normally open contacts of the over current relays. The stop action of the motor shall be made through the motor brake contractor.

3.4.6 The design of the tap changing equipment shall be such that the mechanism will not stop in any intermediate position. However, if the mechanism through faulty operation does stop in an intermediate position, the transformer without injury must carry full load to the equipment. The mechanical position indicator shall be equipped in the motor drive cubicle. The motor shall be designed to be of step control, which in any case the operation shall be of step by step.

3.4.7 The voltage regulating relay shall be supplied together with the timer and under voltage relay. The signal order from the voltage regulating relay to execute the tap changer operation, when the regulating

voltage is out of the voltage regulating level, shall be designed to be delayed by the adjustable timer. If the control voltage falls abnormally, the movement of the tap changer shall be locked by the contact of the under-voltage relay, even if the contacts of the voltage- regulating relay are working.

3.4.8 The control circuit of the transformer shall be completely designed and provision shall be made for parallel operation with another transformer. MASTER- FOLLOWER operation mode shall be provided.

3.4.9 The following accessories, control and selector switches and other necessary accessories shall be furnished.

- a. Remote control board
 - "Parallel operation mode" selector switch
 - "AUTOMATIC-MANUAL" control switch
 - "RAISE-LOWER" control switch
 - Tap position indicator
 - tap change operation program indicator.
- b. In transformer control cubicle
 - "Remote-Local-Test" selector switch
 - "AUTOMATIC-MANUAL" control switch
 - "RAISE-LOWER" control switch
 - Tap position indicator
 - Tap change operation program indicator
 - Voltmeter
- c. In driving mechanism cubicle
 - "Raise-Lower" control switch
 - Means for manual operation when power supply is lost
 - Tap change operation counter

In addition the Remote Tap Control Cubicle shall be equipped with static type annunciator window with flasher for indication of fault condition on the transformer. Cooler control & indication facility shall also be provided at RTCC for manual operation.

3.4.10 Make and Manufacturer

The OLTC Mechanism and Control cubicle including Voltage Regulator, Parallel Control Unit both remote and local shall be ABB, Sweden or MR, Germany or equivalent. However, in case of equivalent make offer, the bidder shall submit the type test report, performance certificate and any other documents substantiating the offered product compatible or at par with above specified make.

3.5 Insulating Oil

The insulating oil shall conform to the latest revision of IEC Publication 60296, properly inhibited for preventing of sludging.

The necessary first filling of oil shall be supplied for the transformer in non- returnable container suitable for outdoor storing. ten percent (10%) excess oil shall also be provided to take wastage into account.

3.6 Oil Preservation System

Oil preservation shall be by means of conservator tank system.

3.6.1 Conservator tank system

- i. The conservator tank shall be mounted on a bracket fixed on the tank.
- ii. The conservator tank may be provided with two compartments, one for the main transformer tank while the other is for the OLTC compartment. The partition barrier shall be provided so that OLTC oil shall not be mixed up with transformer oil under any circumstances.
- iii. One compartment shall be connected with the main transformer tank by pipes through double float Buchholz Relay (gas operated relay) with valves at both ends.
- iv. The other compartment shall be connected with OLTC compartment by pipes through single float Buchholz Relay / oil surge relay with valves at both ends.
- v. Using a flexible urethane air cell shall prohibit contact of the oil in the compartment for the main tank with atmosphere. The cell shall be venting to atmosphere through a silica gel breather and shall in flat or deflate as oil volume changes.
- vi. Both compartments shall be provided with their own breather, filler cap and drain plug.
- vii. Each compartment of the conservator shall be provided with dial type level indicator visible from the ground level and fitted with low oil-level alarm contact. Plain oil level gauge shall also be provided to each compartment.

3.7 Temperature Indicators

- 3.7.1 One set of winding temperature indicator shall be supplied and fitted locally so as to be readable at a standing height from ground level. Necessary current transformer and heating coil for obtaining thermal images of winding temperatures and a detector element shall be furnished and wired.
- 3.7.2 The above winding temperature indicator shall be provided with necessary contacts to take care of the following.
 - a. Starting of cooling units in stages, with rise of temperature.
 - b. Alarm on high temperature
 - c. Trip on higher temperature

One set of oil temperature indicator with maximum reading pointer and electrically separate sets of contacts for alarm and trip shall be mounted locally so as to be readable at a standing height from ground level.

3.7.3 Make & Manufacturer:

The Temperature Indicators should be from the manufacturer: AB KHILSTROM Sweden or equivalent. However, in case of equivalent make offer, the bidder shall submit the type test report, performance certificate and any other documents substantiating the offered product compatible or at par with above specified make.

3.8 Buchholz Relay (Gas Operated Relay-For Conservator Type of Oil Preservation)

3.8.1 The Buchholz Relay shall be provided with two floats and two pairs of electrically separate contacts-one pair for alarm and the other pair for tripping.

3.8.2 Buchholz Relay shall be provided with the facility for testing by injection of air by hand pump and with cock for draining and venting of air.

3.8.3 Pressure relief device with a sudden gas pressure relay shall be furnished and mounted on top of the tank in the region of the gas space. There lay shall respond to sudden increase in internal gas pressure in the transformer due to internal arcing. The relay shall be provided with trip contact.

Above relay shall be stable during change in oil or gas pressure due to change in ambient temperature and / or loading.

3.9 Transformer Bushings

All bushings shall conform to the requirements of the latest revisions of IEC Publication 60137.

The bushing shall be located so as to provide minimum electrical clearances between phases and also between phase and ground as per relevant standards.

All bushings shall be porcelain type and shall be furnished complete with terminal connectors of adequate capacity including arcing horns for HV& LV. The porcelain used in bushings shall be homogeneous, nonporous, uniformly glazed to brown color and free from blisters, burns and other defects.

Stresses due to expansion and contract in any part of the bushing shall not lead to deterioration.

Liquid/oil-filled bushings shall be equipped with liquid level indicators and means for sampling and draining the liquid. The angle of inclination to vertical shall not exceed 30 degree. Oil in oil-filled bushings shall meet the requirement of the transformer oil standards specified.

3.11 Marshaling Box

A sheet steel weather proof marshaling box of IP-55W construction shall be provided. The box shall contain all auxiliary devices except those which must be located directly on the transformer. All terminal blocks for external cable connections shall be located in this box.

The marshaling box shall have the following but not limited to them

a) Load disconnect switch for incoming power supply for auxiliaries.

- b) Cooler fan motor starters and necessary protection.
- c) FAN START-STOP control switch
- d) AUTO-MANUAL selector switch
- e) Wiring and termination individually of the following alarm contacts for remote pre-trip alarm
 - Buchholz relay alarm for main tank (for conservator type)
 - Buchholz / oil surge relay alarm for OLTC
 - Winding temperature high alarm
 - Oil temperature high alarm
 - Tank oil level low alarm
 - OLTC oil level low alarm
 - Tap change in complete alarm
 - OLTC out of step
- f) Wiring and termination individually of the following trip contacts for remote trip and trip alarm
 - Winding temperature high trip
 - Oil temperature high trip
 - Buchholz relay trip or sudden gas and sudden oil pressure relay trip
 - Pressure relief device

Cubicle illumination lamp with doors witch and space heater with the rmostat and ON-OFF switch shall be provided.

Wiring shall be as specified in section under General Technical Specifications.

3.12 Cable Termination

Marshaling box shall be designed to facilitate cable entry from bottom. Removable plates shall be furnished with compression type cable glands to make entry dust tight and no weight is transferred on the terminal. The glands shall be suitable for terminating cable armour. Sufficient space shall be provided to avoid sharp bending and for easy connection. A minimum space of 200 mm from the gland plate to the nearest terminal block shall be provided.

3.13 Terminal Blocks

Terminal blocks shall be as specified in Technical Requirements under section in General Technical Specifications.

3.14 Painting

Painting works shall be as specified in Technical Requirements under section in General Technical Specifications.

3.15 Auxiliary supply

All indications, alarms and trip contacts provided shall be suitable for operation on a nominal 110V DC system.

Tap changing gear shall be suitable for operation of 400 V , $\pm 10\%$, 3phase, 4wire, 50Hz, AC

Cooling fans shall be rated at 400V $\pm 10\%$ 3 Ph, 50Hz, AC.

The tap changing and cooler control supply voltage shall be 400/230V, 50Hz AC.

4 AUXILIARY EQUIPMENT TO BE FURNISHED

4.1 Bushing Current Transformer

Each transformer shall be provided with one (1) set of current transformer each on the

HV and LV terminal bushings to be used for transformer differential relaying.

The transformer shall be provided with neutral bushing current transformer to be used for earth fault protection in High /Low Voltage sides. Current transformer rating and accuracy class shall be as per Appendices and shall be designed to withstand the electromagnetic stresses developed during short circuit.

The current transformer secondary leads shall be wired up to a separate disconnecting type terminal block within the marshaling box. The terminal blocks shall be complete with shorting links.

4.2 Lightning Arresters

The lightning arrestor shall be mounted on tank for nominal Voltage level up to

33kV.

The lightning arrester shall conform to the latest edition of the appropriate IEC Specifications and/or other recognized international standards. In particular:

IEC 60099-4 Metal-oxide Surge arrester without gap for ac system.

IEC 60099-5 Surge arrester –Selection and application recommendations

IEC 60529 Degree of protection provided by enclosures

4.3 Cooling Equipment

Each transformer shall be equipped with a sufficient number of radiators or cooling units to operate as a self-cooled unit or with forced cooled ratings, as specified. Single Stage or double stage fans shall be provided as specified in appendix. Fans shall be automatically controlled by a transformer winding temperature relay.

Fan motors shall be of totally enclosed design and control equipment shall include a circuit breaker with thermal and magnetic trip for each group of fans, contactors with overload protection, and selector switch for MANUAL-AUTOMATIC operation

5 TESTS

5.1 Routine Tests

On completion, each transformer shall be subjected to the following Routine Tests. As far as practical, the procedure of IEC 60076 shall be followed.

- a) Applied voltage test.
- b) Induced voltage test.
- c) No-load loss and excitation current test .
- d) Impedance voltage and load loss test
- e) Winding resistance measurement .
- f) Ratio test.
- g) Polarity and phase-relation test .
- h) Leakage test.
- i) Insulation resistance test
- j) Temperature rise test
- k) Insulation power factor test, etc.

5.2 Special Tests

The following tests shall be performed on transformer:

- a) Zero phase sequence impedance measurement
- b) After fabrication, the tank fitted with all valves, covers, conservator tank etc., shall be completely filled with transformer oil and subjected to a pressure of 25 % over the normal pressure of oil. This pressure shall be maintained for 12 hours during which time there shall be no leakage of oil nor shall there be any permanent set when pressure is released. If any leakage or permanent set occurs, the test shall be conducted again after rectification of defects.
- c) Excitation loss and current measurements shall be made at 90%, 100%, and 110 % of rated voltage.
- d) Measurement of third harmonic voltage.
- e) Measurement of acoustic noise level.
- f) Measurement of harmonics of the no-load current.
- g) Temperature rise test.

5.3 Design Test (Type Test)

Following design tests shall be performed on identical transformers of each type in accordance with latest revision of IEC Publication 60076 should the type test has not earlier been performed on identical or similar rating of Power Transformers:

- a) Impulse voltage withstand test

b) Short circuit test - only design calculations to be submitted confirming withstand capability.

The Bidder shall submit copy of design (Type) test report from recognized testing laboratory for the Power Transformer of the offered type along with the bid.

5.4 Tests on Miscellaneous Components

The various components of the transformer such as insulating oil, bushings, current t Transformers, etc. shall be tested in accordance with the latest revision of relevant standards listed in this Specification. Such test report shall be submitted during inspection or prior to dispatch for NEA approval.

The ON-LOAD tap changer shall be tested in accordance with the relevant IEC standard.

5.5 Test Certificates

Test certificates shall be furnished in required number of copies for approval.

If the inspection is waived, the routine, special and design test certificates of the transformer as well as miscellaneous equipment shall be furnished for approval before the dispatch of the equipment from the factory.

5.6 Tests on delivery

The contractor shall carry out [which the employer's representative(s) shall witness] the following tests in a laboratory owned or nominated by the Employer after delivery in Nepal.

(a) Temperature rise test on at least one power transformer of each rating.

(b) No load Loss and Load Loss test on each delivered quantity.

The sample shall be selected by the Employer's representative(s) from the complete lot of delivered power transformers. Cost of such tests shall be borne by the contractor/supplier and quoted in the Price Schedule in the cost of power transformer itself.

5.7 Field Tests

After Installation at Site, the Transformer shall be subjected but not limited to the following field tests, as far as practical.

- Construction Inspection & Completeness inspection
- Insulating Oil Test
- Insulation Resistance Measurement
- Ratio Test
- Tap Changer Operation Test
- Magnetic Balance Tests
- Vector Group Test
- Winding Resistance Test
- Calibration of WTI & OTI.

- Setting of Alarm / Trip And cooler Controls and operation Check, etc.

6 TENDER EVALUATION AND THE GUARANTEED LOSSES

6.1 Capitalization of Transformer Losses:

When evaluating the individual bid received from various Bidders, the transformer shall be evaluated for the cost of losses based on the following relation.

$$PE = Pb + KL \times LL + KNL \times LNL + KCL \times LCL$$

PE=Evaluated Price

Pb=Bid Price

KL=Value of Load Loss

LL=Guaranteed Load losses at rated Current (Maximum MVA base)

KNL=Value of no Load Loss

LNL=Guaranteed no Load Loss

KCL=Value of Cooler Loss

LCL=Guaranteed Cooler Loss

The transformer losses shall be capitalized as follows:

a) Value of No- Load Losses: US\$ 5670.00 per kW

b) Value of Load Losses: US\$ 2690.00 per kW

c) Loss associated with cooling fan load: US\$ 1420.00 per kW

If the bidders quote unrealistic and unachievable guaranteed transformer loss values (no-load or load losses), then the Employer may ask the bidder to submit technical justifications to substantiate such guaranteed losses. If the justifications are not satisfactory, the proposed transformers shall be rejected and the bid shall be considered non-responsive.

6.2 Guaranteed Values Not Reached

If the individual losses of a power transformer as measured during test exceeds the values guaranteed in the Bid with in the tolerances permitted by relevant standards, then for each kilowatt flosses in excess of the losses guaranteed, an amount at the rates of twice the rates of specified in clause 6.1 for no load losses, load losses and cooling (fan) losses shall be deducted from the Contract Price of the successful Bidder.

Any transformer shall be rejected if losses exceed the guaranteed value by an amount in excess of the following

Total losses: 10%

Component losses: 15% (unless the total loss exceeds 10 %)

In case of loss capitalization, no tolerance shall be permitted for the guaranteed value.

7 PERFORMANCE GUARANTEE

The performance figures quoted on Technical Data Sheet shall be guaranteed within the tolerances permitted by relevant standards listed under section of General Technical Specifications, and shall be come apart of the successful Bidder's Contract. In case of loss capitalization, no tolerance shall be permitted for the guaranteed value. The transformer will be rejected, if the measured no-load and load losses (excluding fan loss) exceed the guaranteed value by over 15% provided that the total losses do not exceed 10% as specified.

8 DRAWINGS, DATA & MANUALS

Submission of Drawings, Data & Manuals by the Bidder along with the Tender

Document and that after the award of Contract for approval shall be as follows:

8.1 Typical general arrangement drawing of the proposed equipment shall be submitted along with the bid.

8.2 After Award of Contract

After award of Contract, the successful Bidder shall submit the required number of copies of following data for approval.

1) Outline dimensional drawing showing the general arrangement, indicating the space required for:

- Cable termination arrangement
- Wheel base dimension & detail

2) Head clearance required for de-tanking of core and coil assembly

3) Foundation plan and loading

4) Transport / shipping dimension with net weight and weights of various parts

5) Final calculation of impedance for each transformer at normal, lowest and highest taps.

6) Schematic flow diagram of cooling system showing the number of cooling units

7) Technical details along with control schematic and wiring diagram for marshaling box, remote tap-changer control panel.

8.3 Any other relevant data, drawing and information necessary for review of the items under Clause No. 8.2 whether specifically mentioned or not, shall be furnished along with this information.

9 NAMEPLATE

Each transformer shall be provided with a name plate of weather resistant material fitted in a visible position showing but not limited to the following items:

- a) Kind of transformer
- b) Manufacturing standard
- c) Manufacturer's name
- d) Year of manufacture

- e) Manufacturer's serial number
- f) Number of phases and frequency
- g) Rated power
- h) Rated voltages and currents
- i) Connection symbol (Vector group)
- j) Percentage impedance at normal, highest and lowest taps at max. base MVA
- k) Type of cooling
- l) Total weight
- m) Weight of insulating oil
- n) Weight of transportation and un-tanking
- o) No-load and Full load losses values in kW
- p) Temperature rise
- q) Connection diagram
- r) Insulation levels
- s) Details regarding tapping.

10 SPAREPARTS

The spare parts shall be provided in required quantities as listed in Price Schedule. Further spare parts as recommended by the manufacturer shall also be included in the Price Schedule. If the spare parts are deemed not required by employer, it can be deleted during contract negotiation.

11 TRANSPORTATION

The core and coils shall be completely dried before shipment and assembled with tank and with oil or dry nitrogen depending upon the size of the transformers. In order to facilitate handling and shipping, as many external accessories as practical, including bushings, shall be removed and replaced by special shipping covers. The Contractor shall give special attention to the limitation of bridge capacity in Nepal and make necessary transportation arrangements accordingly.

Bushings, radiators and other accessories, which may be affected by moisture, shall be packed in moisture proof containers.

Shock recorders shall be installed on the transformers to record maximum shock forces during shipment/transport. This value shall not exceed the value provided by the manufacturer as per standard.

APPENDIX A-1:

TECHNICAL PARTICULARS OF POWER TRANSFORMER AND ACCESSORIES

1.	Rated Voltage	33/11 kV
2.	Rated capacity	6/8 MVA
3.	Type	Outdoor, Oil-immersed
4.	Type of cooling	ONAN/ONAF
5.	Temperature rise above 40 degree C ambient temperature	
	a) In oil by thermometer	50 degree C
	b) In winding by resistance	55 degree C
7.	Number of phases	3(three)
8.	Maximum voltage (line to line)	
	a) Primary	36 kV
	b) Secondary	12 kV
9.	Rated Voltage (line to line)	
	a) Primary	33 kV
	b) Secondary	11 kV
10.	Insulation level of winding	
	a) Basic impulse level as per IEC 76	
	-Primary	170 kV(crest)
	-Secondary	75 kV(crest)
	b) Power frequency induced overvoltage (1 minute)	
	-Primary	70 kV
	-Secondary	28 kV
11.	Connections	
	a) Primary	Delta
	b) Secondary	Star
12.	Vector group reference	Dyn11
13.	Type of tap changer	On – load
14.	Range of taps	±10 %
15.	Number of taps	17
16.	Method of tap changer control	
	-Mechanical local	Yes
	-Electrical local	Yes
	-Electrical remote	Yes
	"MASTER-FOLLOWER-INDEPENDENT" and" AUTO -MANUAL" selection	Yes

17	Percent impedance voltage at rated MVA (ONAF) and 75 degree C. On tap 1 On tap 9(Normal) On tap 17	12.56% 11.94% 11.66%
18.	System grounding	
	a)Primary	Solidly grounded
	b) Secondary	Solidly grounded
19.	Neutral terminals & BCT	
	-Primary	Required
	-Secondary	Required
21.	Bushing Current Transformers	
	a) Number of core & current ratio (HV Phase & Neutral)	1 Core, Current Ratings as appropriate
	b) Number of core & current ratio (LV Phase& Neutral)	1 Core, Current Ratings as appropriate
	c) Core for WTI	1*As required for WTI
	c) Accuracy class	PS class
	d) Burden of BCT(HV/LV)	
22.	Flux Density	Less than 1.6T
23.	Max. Current Density for HV and LV Winding for Rated Current	2.8 A/mm ²

APPENDIX 1.2

REMOTE TAP CHANGER PANEL

Item	Legend	Description	Quantity Per Panel
1.	ANN	Annunciator assembly, 12 active points, 110VDC, 6 rows high by 2 Columns wide, flush mounted; with 3-separately mounted pushbuttons Following minimum annunciations shall be provided: 1.FanBank1Fail 2.FanBank2Fail 3.OLTC Power supply Fail 4.TapchangerOutofstep 5.TransformerCoolingsystemFail 6.TapchangerTemperatureHigh 7.ACFail 8.DCFail All the rest points are for spare	1Lot
2	Relay 90	Only main instruments are listed here. All the auxiliary equipmentsrequired for satisfactory operation of the scheme shall be included by the Contractor. a. AVR as short listed, with future provision for parallel operation. b. Tap Position Indicator c. AC Relay & Under Voltage Protection Relay d. DC failure relay if required	1Lot 1Lot 1Lot 1Lot
3		Interlocks, Switching & tripping Relay (where Required)	1Lot
4.	V	Indicating Voltmeter For specified PT ratios (For1AmpSecondary).	1Lot
5.		Indication lamps for status indications	1 Lot

6.	Other relays and equipment required as per specs and satisfactory Operation of the transformer	
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APPENDIX 1.3

TRANSFORMER ACCESSORIES

Each transformer furnished under this specification shall be equipped with the following accessories:

1. Oil conservator with two compartments each with filler caps and drain plugs.
2. Two sets of Silica Gel breathers with connecting pipe and oil seal.
3. Air release plug.
4. Double float Buchholz Relay with electrically separate trip and alarm contacts for transformer tank.
5. Two Nos. of shut-off valve set both sides of each Buchholz Relay.
6. Mechanically operated self resetting type pressure relief device with visible operation indicator and trip contact.
7. 150 mm Dial Magnetic Oil Level Gauge with low level alarm contact.
8. Direct Reading Plain Oil Level Gauge.
9. 150 mm Dial Oil Temperature Indicator with maximum reading pointer and individually adjustable electrically separate sets of contact for alarm and trip.
10. 150 mm Dial Winding Temperature Indicator with individually adjustable electrically separate sets of contact for two stage cooler control, alarm and trip with detector element complete with heating coil, CT's etc.
11. Drain valve with threaded adapter.
12. Sample valve (top and bottom)
13. Filter valves with threaded adapter (top and bottom)
14. Cover lifting eyes
15. Jacking pads, hauling and lifting lugs.
16. Bi-directional flanged wheels.
17. Rails
18. Clamping device with nuts and bolts for clamping the transformer on foundation rails.
19. Ladder with safety device for access to the transformer top and Buchholz Relay
20. Ground pads each with two (2) nos. tapped holes, bolts and washer for transformer tank, radiator bank and cable end box grounding.
21. Rating plate and terminal marking plate.
22. Marshaling box for housing control equipment and terminal connections.
23. Any other standard accessories including arcing horns.

2. 33 kV CIRCUIT BREAKER

2.1 General

This specification covers the design, manufacture, assembly, shop test, supply, delivery, installation works and field test of 33kV vacuum circuit breakers complete with all accessories for efficient and trouble free operation as specified here in under.

Circuit breakers shall be offered from reputed makes like Hitachi /GE /ABB /Mitsubishi /LG /Fuji / Siemens or Areva or equivalent.

The equipment specified in this Section shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards. In particular:

IEC 60056 High-voltage alternating switchgear
IEC 62271 High-voltage alternating switchgear and control gear
IEC 60376 Specification and acceptance of new Sulphur hexafluoride
IEC 60529 Degree of protection provided by enclosures
IEC 60694 Common specifications for high-voltage switchgear and control gear standards
Manufacturer of 33 kV Circuit Breaker shall hold valid ISO 9001 quality certificate (including design).

2.2 Equipment to be furnished

2.2.1 The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

2.3 Design Requirements

2.3.1 The circuit breakers shall be suitable for 3 phase, 50Hz in 33kV system.

2.3.2 Circuit breaker shall be installed outdoor in a hot and humid climate. All equipment and accessories shall be provided with tropical finish to prevent fungus growth.

2.3.3 The maximum temperature rise in any part of the equipment at specified rating shall not exceed the permissible limit as stipulated in relevant standards. The de-rating of the equipment shall be made taking 45 deg. C as an ambient temperature of the site, if it is designed for any lower ambient temperature.

2.3.4 The rated peak short circuit current or the rated short time current carried by the equipment shall not cause:

- (a) Mechanical damage to any part of the equipment.
- (b) Separation of contacts.
- (c) Insulation damage of “Current Carrying Part”.

2.3.5 Technical particulars of the circuit breaker shall be as per Appendix 1.5.1.

2.3.6 All auxiliary equipment shall be suitable for 3 phase 4 wire, 50Hz, 400 V.

1.4 Construction Features

2.4.1 This circuit breaker shall be outdoor, three phase, single throw, pneumatically or spring charged motor operated, vacuum type, trip free in any position, complete with operating mechanism and supporting structure.

2.4.2 Bushing or tanks shall be accurately aligned and assembled with the operating mechanism as a complete rigidly mounted unit on a structural steel base or frame at the factory, to permit shipment and installation as an assembled unit.

2.4.3 Contacts

The contacts shall be designed to have adequate thermal and current carrying capacity for carrying full-rated current without exceeding the allowable temperature rise as specified by IEC standards. They shall be designed to have long life so that frequent replacement or maintenance will be unnecessary. The surfaces of both moving and stationary arcing contacts, which are exposed directly to the arc, shall be faced with suitable arc resisting material.

2.4.4 Local test switch

Each mechanism shall be equipped with a local test switch for electrically testing the closing and tripping operations of the circuit breaker. A separate manually operated cutout device to disconnect the circuits to remote closing, re-closing and tripping devices shall be provided on each circuit breaker. A warning nameplate requiring operation of this device before operation of the local test switch shall be mounted adjacent to the local test switch.

2.4.5 Emergency trip

Each circuit breaker shall be provided with an emergency hand trip device. This device shall be provided with mechanically interlocked contacts to disconnect circuits from remote closing and re-closing devices.

2.4.6 Position indicator

The circuit breaker shall be equipped with mechanical position indicator. The indicator shall be provided for each pole.

2.4.7 Operating mechanism

The operating mechanism of the circuit breakers shall be spring charged by 110V D.C. motor and with mechanical charging.

The tripping circuit mechanism and the closing control circuit mechanism shall each have a nominal voltage rating of 110 volts DC. The tripping circuit shall operate satisfactorily for a tripping operation over a voltage range of 70-110%. The closing control circuit shall operate satisfactorily over a voltage range of 85-110%.

2.4.8 Operation Counter

There shall be the counter to read the number of operation of VCB.

2.4.9 Accessories

The Contractor shall furnish following accessories as an integral part of the circuit breaker:

- (a) Padlocks and duplicate keys
- (b) Operation counter (c) Earthing terminals (d) Nameplate
- (e) Other necessary accessories
- (f) Operating handle

2.4.10 Spare parts

Following spare parts shall be provided in required quantities as listed in Price Schedule.

2.5 Tests

2.5.1 Routine tests

One circuit breaker of each type ordered under the Contract shall be fully assembled at the manufacturer's works and subjected to routine tests in accordance with IEC 56 and shall comprise but not limited to the following.

- (a) Construction inspection
- (b) Leakage test
- (c) Operating speed check
- (d) Dielectric test
- (e) Pressure test
- (f) Control and secondary wiring check test
- (g) Mechanical operation test
- (h) Operating mechanism system check

2.5.2 Design tests

The Contractor shall conduct the following design tests on one circuit breaker being furnished. However, if these tests have been previously conducted on identical circuit breakers, the Contractor may furnish certified copies of such previous reports instead of performing tests on the actual circuit breakers being furnished. The Bidder shall submit the copy of design test for identical circuit breaker with the proposal.

- (a) Bushing tests
- (b) Dielectric withstand test
- (c) Current carrying test
- (d) Normal current switching test
- (e) Short circuit switching test
- (f) Mechanical operation life test

If a circuit breaker has been used for design tests, the test breaker will not be accepted unless the following minimum maintenance are completed, including any other provisions not included herein, but required to render the breaker equivalent of a new breaker:

- (a) Replace all latches and pins
- (b) Replace all major parts which are subject to fatigue, including, but not restricted to, contacts, movable cross-heads, spring and linkages.

2.5.3 Field tests

After installation at Site, the circuit breaker shall be subjected but not limited to the following field tests:

- (a) Construction inspection
- (b) Measurement of insulation resistance
- (c) Operating speed check
- (d) Mechanical operation test
- (e) Operating mechanism system check

2.6 Performance Guarantee

The performance guarantee figures quoted on the schedule of technical data shall be guaranteed within the tolerances permitted by relevant standard and will become a part of successful Tender's Contract.

2.7 Drawings, Data and Manuals

2.7.1 The following drawings and data shall be furnished along with the Tender. (a) General equipment layout

- (b) Outline drawings of the breaker and control cubicle with accessories

2.7.2 After award of Contract the successful Bidder shall submit the required number of copies of the following drawings and data for approval of the Employer/Employer's Representative.

- (a) General equipment layout
- (b) Outline drawing of the breaker and control cubical with accessories.
- (c) Loading data and foundation detail.
- (d) Elementary control wiring diagram.
- (e) Internal wiring diagram.
- (f) External connection diagrams, showing terminal boards and other external connection points for each assembly and the required interconnecting wiring.
- (g) Drawing showing typical cross-section of the operating mechanism and breaker mechanism.
- (h) Drawing showing typical cross-section and assembly of interrupting device.
- (i) Drawing showing assembly of principal component parts and accessories.
- (j) Drawing showing details of bushing or porcelain supporting columns, including dimension details of flanges and outline dimensions.
- (k) Drawing to show details at all points where adjustments may be made to operating dimension mechanism, breaker mechanisms and contacts.
- (l) Any other drawings and data required for design and installation of circuit breaker.
- (m) Instruction manual for storage, installation, operation and maintenance of circuit breaker and operating mechanism.

2.8 Nameplate

Each circuit breaker shall be provided with nameplate of weather resistant material fitted in a visible position showing the following items as a minimum.

- (a) Manufacturer's name
- (b) Manufacturer's serial number and type designation
- (c) Year of manufacture
- (d) Rated voltage, kV
- (e) Rated insulation level, kV
- (f) Rated frequency, Hz
- (g) Rated normal current, A
- (h) Rated short-circuit breaking current, kA
- (i) Rated interrupting time cycles
- (j) Weight of circuit breaker, kg

2.9 Special Tools

In addition to the tools, which are regularly furnished with such breakers, the Contractor shall also supply all necessary special tools or equipment for assembling and disassembling the breaker. The Contractor shall submit an itemized list of such equipment.

APPENDIX 1.5.1

TECHNICAL PARTICULARS OF 33 kV CIRCUIT BREAKER

1. Type Vacuum, outdoor type
2. Quantity required As per Price Schedule
3. Voltage rating
 - (a) Nominal system voltage 33kV
 - (b) Rated maximum voltage 36kV
4. Insulation level
 - (a) Impulse withstand voltage 170kV
 - (b) Power frequency withstand voltage (1 min) 75kV
5. Frequency 50Hz
6. Current rating
 - (a) Rated continuous current at 45 deg. C ambient 1250 A
 - (b) Rated interrupting current 25 kA
7. Re-closing duty cycle (Rated operating sequence) 0-0.3 sec-CO-3 min.-CO
8. Auxiliary supply
 - (a) Control circuit DC 110V
 - (b) Space heater and auxiliary equipment AC, 3Ph-4W, 400V, 50Hz
- 9.

Total maximum break time	60 ms
First pole to clear factor	1.5
Additional Auxiliary Contacts	8 NO, 8 NC
Maximum make time	120 ms
Spring charging motor	110 V DC

3. POWER FUSE

General

This specification covers the design, manufacture, assembly, shop test, supply, delivery, installation works and field test of power fuse.

Manufacturer of fuse shall be holder of valid ISO 9001 Certificate

Equipment to be furnished

The equipment to be furnished shall strictly be in accordance with the Price Schedule.

Design Requirements

Power fuse shall be in accordance with IEC standards. The fuse set shall be of drop out type and fuse shall be contained inside fiberglass suitable for outdoor use in a tropical climate. Complete fuse mountings and holders shall be furnished as specified in Technical Particulars enclosed. Refill units are to be furnished separately.

All terminals shall be of high conductivity copper alloy and all terminals for aluminum shall be plated with hot-flamed electro-tin or cadmium.

The insulated stick furnished for replacing the fuses shall be 6 m (20 feet) and a combination type suitable for operating hook stick disconnecter. The stick shall be of fiberglass or plastic over a wood or plastic foam cane and have voltage withstand rating of 246kV per meter.

Technical particulars of power fuse shall be as per Appendices enclosed.

Tests

In addition to the manufacturer's routine production tests, power fuse of each type and rating shall be subject to the tests in accordance with IEC standards.

Data

The contractor shall furnish complete data for applying and coordinating the fuses supplied. This data shall include log-log time-current curves of minimum and maximum clearing for each fuse size furnished.

APPENDIX 1.1.1

TECHNICAL PARTICULARS OF POWER FUSE

A. 33kV POWER FUSE.

1. Type: Single pole, single throw, drop out, hook stick operated, outdoor type
2. Quantity required

(a) Power fuse As per Price Schedule

3. Voltage ratings

(a) Nominal voltage class 33kV

(b) Rated maximum voltage 36kV

4. Basic impulse level (BIL) 170kV

5. Current rating 100A

6. Interrupting rating 8kA (Symmetrical)

7. Mounting position

(a) Power fuse Horizontal

4. 33 kV Disconnecting Switch

4.1 General

This specification covers the design, manufacture, assembly, shop test, supply, delivery, installation works and field test of disconnecting switches complete with all accessories for efficient and trouble-free operation as specified herein under.

The equipment specified in this Section shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards. In particular:

IEC 60129 High-voltage alternating current disconnector and earthing switches

IEC 60529 Degree of protection provided by enclosures

Manufacturer of isolator shall hold valid ISO 9001 quality certificate (including design).

4.2 Equipment to be furnished

33 kV Disconnecting Switch

4.2.1 The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

4.3 Design Requirements

4.3.1 The disconnecting switches shall be used for the 33kV. 50Hz, 3 phase system.

4.3.2 The equipment shall be installed outdoor in a hot, humid climate. All equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth.

4.3.3 The maximum temperature rise in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in relevant standards. The de-rating of the equipment shall be made taking 45 deg. C as an ambient temperature of the site, if it is designed for any lower ambient temperature.

4.3.4 The rated peak short circuit current or the rated short time current carried by the equipment shall not cause:

- (a) Mechanical damage to any part of the equipment
- (b) Separation of Contacts
- (c) Insulation damage of "Current Carrying Part."

The disconnecting switches shall be rotating post type with contact blades moving through horizontal plane.

4.3.6 The rating, the accessories to be furnished and the schedule of equipment are detailed in Appendices.

4.3.7 The disconnecting switches shall be able to carry the rated current continuously and rated short time current for three seconds without exceeding the temperature limit specified in the relevant standard.

4.3.8 The disconnecting switches shall be capable of withstanding the Dynamic and thermal effects of maximum possible short circuit current at the point of its installation.

4.4 Construction Features

4.4.1 The 3-pole disconnecting switches shall be gang operated type so that all the poles make and break simultaneously.

4.4.2 The disconnecting switches shall be designed for upright mounting on steel structure.

4.4.3 The disconnecting switches shall have padlocking arrangement in both "open" and "closed" positions.

4.4.4 All current carrying parts shall be non-ferrous metal or alloy. All live parts shall be designed to avoid sharp points and edges.

4.4.5 All metal parts shall be of such material and treated in such a way as to avoid rust, corrosion and deterioration due to atmospheric conditions. Ferrous parts shall be hot-dip galvanized.

4.4.6 Bolt nuts, pins, etc. shall be provided with appropriate locking arrangement such as locknuts, spring washers, key etc.

4.4.7 Bearing housing shall be weatherproof with provision for lubrication. The design, however, shall be such as not to require frequent lubrication.

4.4.8 All bearings in the current path shall be shorted by flexible copper conductor of adequate size (minimum-70sqmm) to allow the specified fault current through it without injury.

4.4.9 Main contacts

The main contacts shall be of silver-plated copper alloy and controlled by powerful springs designed for floating and pressure point contact.

The contacts shall have sufficient area and pressure to withstand the electromagnetic stresses developed during short circuit without excessive heating liable to pitting or welding.

Contacts shall be adjustable to allow for wear, shall be easily replaceable and shall have minimum movable parts and adjustments.

The blade shall be made of electrolytic copper tube or aluminum tube of liberal section. Rotating feature of the blade at the end of tube travel for contact wiping shall be provided.

Arcing horns shall be provided to divert the arc from main contacts to the separating horns after the main contacts have opened. Arcing horns shall be renewable type.

4.4.10 Insulators and terminals

Insulators shall be post type, brown glazed and composed of stacked units.

The porcelain used for insulators shall be manufactured by wet process and shall be homogeneous and free from cavities and other flaws.

Caps and pins shall be of the highest quality malleable iron or forged steel and smoothly galvanized.

Arcing horn as required shall be furnished.

All insulators of identical ratings shall be interchangeable.

The terminals of the disconnecting switch shall be provided with terminal connectors.

4.5 Operating Mechanism

4.5.1 Disconnecting switches for 33kV.

The operating mechanism for 33kV shall be manually operated.

The manual operating mechanism shall be of torsion type suitable for operation in the horizontal plane. The

operating handle shall be equipped with each switch and shall be arranged for mounting on the steel base supporting structures. Means shall be provided on each switch for taking up loose motion in the operating mechanism and for adjusting the travel of each blade independently. The Contractor shall furnish all supplemental members required to secure the installation of the complete switch mechanism to the supporting structures.

All switches shall be self-locking in the open and closed positions independent of the control shaft restraint. Each mechanism shall be provided with an indicator showing direction of rotation for opening or closing, and shall be provided for grounding and for padlocking in the open and closed positions.

Each operating mechanism shall be furnished complete with all necessary operating pipes, interphase shafts, pipe couplings, guide bearings, ground braids, mounting brackets, mounting bolts, operating handle, auxiliary switches and offsets required for operation from the ground. All operating rods and levers shall be cut to length and all machining operations and threading shall be complete in the factory.

The manually operated disconnecting switches shall also be provided with a minimum four (4) normally closed and four (4) normally open auxiliary contacts for remote indications.

4.6 Assembly

Each disconnecting switches along with its base frame and operating mechanism shall be completely assembled and checked at manufacturer's works for correct alignment and operation prior to dispatch.

All parts and accessories shall have appropriate match marks and part number for identification at site.

4.7 Tests

4.7.1 Type and routine tests on the equipment and components shall be in accordance with latest revision of IEC Standards or equivalent standards approved by the Employer/Employer's Representative.

Each switch shall include but not limited to the following tests:

(a) Routine tests

- Power frequency voltage dry test
- Measurement of resistance of main circuit
- Control and secondary wiring check test
- Mechanical operation test

(b) Design tests

- Insulator test
- Dielectric test, including impulse withstand test
- Radio influence test
- Short-time current test
- Voltage drop test the voltage drop across one complete phase of a switch shall be measured when carrying rated current.
- Temperature Rise Test

If type tests have been previously conducted on identical disconnecting switch, the Contractor may furnish the certified copies of such previous reports instead of performing

tests. The Bidder shall submit copy of design test report from accredited testing laboratory for the disconnecting switch of the offered model along with the bid.

4.7.2 The type and routine test certificate shall be furnished in the required number of copies to the Employer/Employer's Representative for approval before dispatch of the equipment from the works.

4.7.3 Field tests

After installation at Site, the disconnecting switches shall be subjected but not limited to the following field tests:

- (a) Construction inspection
- (b) Measurement of insulation resistance
- (c) Mechanical operation test

4.8 Drawings, Data and Manuals

4.8.1 The following drawings and data shall be furnished with the Tender.

- (a) General arrangement drawing with different sections showing constructional features.
- (b) Technical leaflets on disconnecting switches offered explaining the function of various parts, principle of operation and special features (if any).
- (c) Typical type test results on identical equipment offered in the Tender.

4.8.2 The various drawings, data and manuals shall be submitted for approval and afterwards for final distribution in quantities and in procedures as set-up elsewhere. The various drawings and data to be furnished shall include:

- (a) Outline dimensional drawings of the equipment showing general arrangement and location of fittings.
- (b) Transport/shipping dimensions with weights.
- (c) Foundation and anchor bolt details including loading condition.
- (d) Assembly drawing for erection at site with part numbers and schedule of materials.
- (e) Electrical schematic and wiring diagram.
- (f) Any other relevant drawings and data necessary for erection, operation and maintenance.
- (g) Instruction manual and data sheets.
- (h) Any other relevant data, drawing and information necessary for review of the items stated above.

APPENDIX A-1

TECHNICAL PARTICULARS OF 33kV DISCONNECTING SWITCH (WITH GROUNDING SWITCH)

- | | |
|--|-------------------------------|
| 1. Type | 3-pole, single throw, outdoor |
| 2. Quantity required | As per Price Schedule |
| 3. Voltage ratings | |
| (a) Nominal system voltage | 33kV |
| (b) Rated maximum voltage | 36kV |
| 4. Frequency | 50Hz |
| 5. Insulation levels | |
| (a) Basic impulse level (BIL) | 170kV |
| (b) Power frequency withstand voltage (1 min.) | 75kV |
| 6. Current ratings | |
| (a) Continuous current | 800A |
| (b) Short time current (1 seconds) | 25 kA |
| (c) Peak short time current | 32kA |
| (d) Making current of grounding switch | 32kA |
| 7. Operating mechanism | Manually gang operated |

APPENDIX A-2

TECHNICAL PARTICULARS OF 33kV DISCONNECTING SWITCH (WITHOUT GROUNDING SWITCH)

- | | |
|--|-------------------------------|
| 1. Type | 3-pole, single throw, outdoor |
| 2. Quantity required | As per Price Schedule |
| 3. Voltage ratings | |
| (a) Nominal system voltage | 33 kV |
| (b) Rated maximum voltage | 36 kV |
| 4. Frequency | 50 Hz |
| 5. Insulation levels | |
| (a) Basic impulse level (BIL) | 170 kV |
| (b) Power frequency withstand voltage (1 min.) | 75 kV |
| 6. Current ratings | |
| (a) Continuous current | 800 A |
| (b) Short time current (1 seconds) | 25 kA |
| (c) Peak short time current | 32 kA |
| 7. Operating mechanism | Manually gang operated |

5. Instrument Transformer

5.1 General

This specification covers the design, manufacture, assembly, shop test, supply, delivery, and installation works and field test of instrument transformers as specified herein under.

The equipment specified in this Section shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards. In particular:

IEC 60044	Voltage transformers
IEC 60044	Instrument transformers
IEC 60529	Degree of protection provided by enclosures

Manufacturer of instrument transformer shall hold valid ISO 9001(including design) quality certificate.

5.2 Equipment to be furnished

The Following Equipment shall be furnished, if seemed necessary, after the approval of Schematic Diagram submitted by the Bidders or as Instructed by the Owner. The Schematic diagram should be prepared and submitted by the Bidders with Technical Proposal, after studying the existing Protection and Metering System, such as to provide necessary and adequate Protection to the Transformer Bay as a Whole. The Bidders are required to make the Site visit and access necessary Data and Drawings from the respective Substation. Similarly, the details about the Ratio / Burden / Class will be finalized after the approval of the Schematic Diagram or as Instructed by the Owner.

33 kV Current Transformer for Measurement & Protection

33 kV Bushing Current Transformer for Protection

11kV Bushing Current Transformer for Protection

11kV Current Transformer for Measurement & Protection.

11kV / 110V Potential Transformer for measurement & Protection

33kV / 110V Potential Transformer for measurement & Protection

5.3 Design Requirements

5.3.1 Instrument transformers shall be suitable 33kV 50Hz. 3 Phase with neutral solidly grounded system.

5.3.2 Instrument transformers shall be installed outdoor in a hot, humid climate. All equipment and accessories shall be provided with tropical finish to prevent fungus growth.

Burden of the instrument transformers stated herein is the minimum value required. Where higher burden is required to suit the designs, the Contractor shall supply the same without additional cost.

5.4 Construction Features

5.4.1 The instrument transformers shall be oil-filled construction and shall be designed for outdoor service and suitable for vertical mounting.

5.4.2 The core and coils of current transformer shall be mounted in a steel tank on the top of the unit with the primary coil leads extending through insulated bushings for series or multiple connections. A steel base shall support the high voltage bushing and tank. The high voltage bushing shall be sealed to the tank and the base with oil-tight joints.

5.4.3 The primary terminals of instruments shall include provisions for externally connecting the primary winding. The secondary terminals shall be enclosed in a weatherproof terminal box.

5.4.4 Porcelain bushings shall have adequate mechanical and electrical strength. The color of porcelain shall be brown.

5.4.5 Junction boxes

Junction boxes shall be rigid weatherproof type complete with terminal blocks suitable for cable size having the range up to 2x6 sq. mm for termination of the secondary connections (such as delta or wye connection). They shall be made of metal, which will resist corrosion on both inside and outside surfaces; otherwise they shall be suitably protected by galvanizing. Cover of the junction box shall be of hinge door type complete with door handle. Two drainage holes shall be provided at the bottom of the junction box. In case the junction boxes are steel sheet, the thickness of such steel sheet shall be at least

1.2mm. Junction boxes shall be sized and arranged to provide easy access for external cables and adequate space for internal wiring and installed equipment. Enclosure protection class of the junction boxes shall be IP55W

The terminal blocks used should be provided with shorting links on the top of the unit with the primary coil leads extending through insulated bushing for series or multiple connections. A steel base shall support the high voltage bushing and tank. The bushings shall be sealed to the tank and the base with oil tight joints.

5.4.7 Termination

(a) Current transformers

All current transformer secondary winding terminals shall be connected to terminals on terminal located in the junction boxes. In addition, a short -circuit type terminal block

shall be provided for each maximum ratio of each core at the terminal blocks in both the secondary terminal box and junction box.

(b) Potential transformer

All PT's secondary terminals shall be connected to terminals on terminal blocks located in the junction boxes.

5.4.8 Protective devices

(a) The secondary phase wire for external connection shall be equipped on all potential transformers with switch and fuse. Fuses shall be rated to provide external short-circuit protection and shall be high rupturing capacity non- deteriorating type. Switches shall be rated not less than 250V AC 50Hz. Switches and fuses shall be contained within the junction box provided for termination. Supply fuse failure supervision shall be provided.

5.4.9 Accessories

The following items shall be provided for each instrument transformer: (a)

- Nameplate
- (b) Oil level gauge
- (c) Oil valves or plugs
- (d) Power factor test terminals
- (e) Necessary terminal connections
- (f) Grounding terminals
- (g) Other necessary accessories

5.5 Tests

Tests shall be performed as specified hereunder.

5.5.1 Current transformer

(a) Routine tests

Each current transformer shall be subjected to the following tests.

- Applied potential test
- Induced potential test
- Accuracy tests (including excitation curve for relaying class)
- Polarity check
- Winding resistance measurement for each ratio

(b) Design tests

Type test records of an identical unit of current transformer shall be submitted to Employer/Employer's Representative. In case type test records are not available, the actual tests shall be performed. The items of test shall be as follow:

- Short time current test
- Temperature rise test
- Power frequency withstand voltage (wet) test
- Impulse voltage withstand test
- Temperature rise test

5.5.2 Potential transformer

(a) Routine tests

Each capacitor voltage transformer shall be subjected but not limited to the following tests:

- Power frequency withstand voltage (dry) test.
- Dielectric tests for electromagnetic unit
- Accuracy tests
- Polarity check
- Ratio test

(b) Design tests

Type test records of an identical unit of potential transformer shall be submitted. In case type tests records are not available, the actual tests shall be performed. The items of test shall be as follows:

- Voltage test between phase and ground terminals
- Power frequency withstand (wet) test
- Impulse test
- Radio-influence voltage test
- Short-time over voltage test
- Thermal burden test

5.5.3 Field tests

After installation at Site, all instrument transformers shall be subjected but not limited to the following tests:

- (a) Constructions inspection
- (b) Polarity check
- (c) Ratio test
- (d) Measurement of insulation resistance

5.6 Drawings, Data and Manuals

5.6.1 The following drawings and data shall be furnished with the Tender.

- (a) Outline dimensional drawings of the equipment
- (b) Characteristics and performance data
- (c) Type test certificates of similar equipment

5.6.2 After award of Contract the successful Bidder shall submit the required number of copies of the following drawings for approval of the Employer/Employer's Representative.

- (a) Outline dimensional drawings of the equipment
- (b) Transport/shipping dimensions with weights
- (c) Foundation and anchor bolt details
- (d) Characteristic and performance data including ratings, ratio and phase angle curves, accuracy for standard burdens, and thermal burden ratings.
- (e) Instruction books including complete information for installation, testing, operation and maintenance with renewal parts data.
- (f) Any other relevant drawings and data necessary for review of the items stated above.

APPENDIX A-1

TECHNICAL PARTICULARS OF 33kV CURRENT TRANSFORMER

1. Type	Outdoor, oil immersed for protection and metering
2. Quantity required	As per Price Schedule
3. Rated primary voltage	33 kV
4. Max. system voltage	36 kV
5. Impulse withstand voltage	170 kV
6. Rated frequency	50 Hz
7. Number of cores	2
8. Current Ratio	400-200-100/5A for Transformer 1200-600-300/5A for Line
9. Rated Burden	50 VA
10. Accuracy	5P/20 and 0.5 for metering
11. Power Factor	0.85
12. Over voltage factor	1.1 Continuous 1.5 For 30 sec
13. No of secondary windings	as required
14. Over load factor	200%
15. Short time thermal rating	25 kA

APPENDIX A-2

TECHNICAL PARTICULARS OF 33kV POTENTIAL TRANSFORMER

1. Type	Outdoor, oil immersed
2. Quantity required	As per Price Schedule
3. Rated primary voltage	33/ $\sqrt{3}$ kV
4. Max. system voltage	36kV
5. Impulse withstand voltage	170kV
6. Rated frequency	50Hz
7. Connection	Line to ground
8. Number of secondary winding	2
9. Voltage ratio	33,000/ $\sqrt{3}$ 110/ $\sqrt{3}$ V
10. Rated burden for each winding	100 VA
11. Accuracy	5P and 0.5 for metering

- | | | |
|-----|----------------------|--------------------------------|
| 12. | Power factor | 0.85 |
| 13. | Rated voltage factor | 1.1 continuous, 1.5 for 30 sec |

6. Lightning Arrester

6.1 General

This specification covers the design, manufacture, factory test, delivery, field test and installation of lightning arresters, complete with all accessories.

The equipment specified in this Section shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards. In particular:

IEC 60099-4 Metal-oxide Surge arrester without gap for a.c. system

IEC 60099-5 Surge arrester - Selection and application recommendations

IEC 60529 Degree of protection provided by enclosures

Manufacturer of instrument transformer shall hold valid ISO 9001(including design) quality certificate.

6.2 Equipment to be furnished

30 kV Lightning Arrestor

6.2.1 The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

6.3 Design Requirements

6.3.1 The lightning arresters shall be station type, single pole, gap less type rated voltage 30kV for 33kV system. The nominal discharge current shall not be less than 10kA.

6.3.2 The active part of the lightning arresters shall be accommodated in porcelain insulators which are suitably reinforced to prevent explosion of an arrester.

6.3.3 Pressure relief device shall be provided for the safe discharge of internal pressure.

6.3.4 The lightning arresters shall be mounted on galvanized steel structure. Terminal connectors for both line and ground terminals shall be furnished.

6.3.5 Surge monitoring device consisting of surge counter, etc., along with insulating bases for mounting at the bottom of the arrester, shall be furnished.

6.4 Test

6.4.1 All routine tests shall be performed on each piece of arrester as per IEC. In addition, the following tests shall be carried out.

- (a) Construction test
- (b) Insulation resistance test and leak current test

6.4.2 Type test certificates on similar equipment and routine test certificate carried out for following

tests shall be furnished for approval of the Employer/Employer's Representative.

- (a) Voltage withstand test
- (b) Impulse voltage characteristic test
- (c) Discharge voltage characteristic test
- (d) Discharge current withstand test
- (e) Duty cycle test
- (f) Pressure relief test
- (g) Contamination test

6.5 Drawings and Data

6.5.1 The following documents shall be furnished along with the Tender.

- (a) Standard catalog identifying the models and ratings being furnished.
- (b) Outline drawings including dimensions

6.5.2 The following drawings and data shall be furnished in required number of copies after award of contract for approval of Employer/Employer's Representative.

- (a) All updated documents furnished with the Tender.
- (b) Outline drawings including dimensions
- (c) Foundation and anchor details including dead load
- (d) Transport/shipping dimensions with weight
- (e) Any other relevant data, drawings and information

6.6 Nameplate

Each lightning arrester shall be provided with a nameplate of weather resistant material fitted in a visible position showing the following items as a minimum.

- (a) Manufacturer's name
- (b) Manufacturer's serial number and type designation
- (c) Year of manufacture
- (d) Rated voltage
- (e) Nominal discharge current

APPENDIX A-1

TECHNICAL PARTICULARS OF 30kV LIGHTNING ARRESTER

1.	Type	Outdoor, station type
2.	Quantity required	As per Price Schedule
3.	Mounting	Pedestal
4.	Rated frequency	50Hz
5.	System voltage	33kV
6.	Rated voltage	30kV
7.	Impulse withstand voltage (BIL)	170kV
8.	Power frequency withstand voltage	70kV
9.	Nominal discharge current	10kA
10	Surge Counter	shall be the ISO 9001 holding company

7. CONTROL AND RELAY PANEL

7.1 General

7.1.1 This specification covers Study, Design, Manufacture, Assembly Factory Test, Supply, Delivery, Installation works and Field Test and Commissioning of Control and Relay Panels as specified herein under. The panel shall be used for the protection of the following:

Manufacturer of Control, Protection Equipment, and Relays shall hold valid ISO 9001 quality certificate (including design).

Transformer Protection equipment/ relays as required shall have to be supplied and installed accordingly.

7.1.2 It is not the intent to specify completely herein all details of Design and Construction of Equipment supplied. However, the equipment supplied shall conform, in all respects, to high standards of Engineering, Design and Workmanship and be capable of performing in continuous commercial operation up to Contractor's guarantee in a manner acceptable to the Employer who will interpret the meaning of Drawings and Specifications and shall have the power to reject any work or material which in his judgment are not in full accordance therewith.

The Bidder shall submit his proposed Control Panel Arrangement & Layout. The Bidder is warned that the available space in the existing control rooms is very limited and the panels shall be of such size to fit in available space.

The cost of any relocation of equipment in the control room and outdoor switchyard necessary to complete the specified works shall be included in his bid price and no additional payment will be made for such work.

7.1.3 The indication and annunciation schemes for existing substations shall be compatible with the existing system as far as possible.

7.1.4 Manufacturers for Protection Equipment

All protection relays like over current, earth fault, differential, definite time over current etc shall be of static type and shall be from following manufacturers or equivalent.

- a) AREVA
- b) Fuji
- c) CGELEC
- d) Reyrolle / Easun Reyrolle
- e) ABB
- f) Siemens
- g) Toshiba
- h) Mitsubishi

In case of equivalency the manufacturer must submit the authentic documents from internationally recognized testing agency establishing that the offered product is equivalent to above referred make.

7.2 Equipment to be furnished

7.2.1 Control and Relay panels shall be more or less of the color matching with the existing one.

7.2.2 In addition to the above, the following shall be supplied:

- (a) Floor channel seals, vibration damping pads, kick plates, earthing pads and holding down bolts and nuts.
- (b) Special tools and tackle.

7.3 Construction Features

7.3.1 The Panel Dimensions specified are tentative only and it is the responsibility of Bidder to ensure that all the equipment required can be properly accommodated in the respective space. The panels shall also be of a size & type which can be easily accommodated within the space of existing Panels & existing control room without the necessity for expansion of the control room. Such oversized panels will not be accepted.

7.3.2 The 33 kV panel shall be of Simplex type or Duplex type as per the layout of the respective Substation.

In case, the Panels are Duplex type, it shall comprise two vertical front and rear panel sections connected back-to-back by formed sheet steel roof tie members and a central corridor in between. The corridor shall facilitate access to internal wiring and external cable connections. Both ends of the corridor shall be provided with double leaf doors with lift off hinges.

Doors shall have handles with built-in locking facility. Separate cable entries shall be provided for the front and rear panels. However, interconnection between panels shall be by means of inter panel wiring at the top of the panels.

If the panels are of Simplex type, it shall comprise of two vertical fronts side by side, with door at rear sections with built in locking facility.

7.3.3 Panels shall be completely metal enclosed and shall be dust, moisture and vermin proof. Panel enclosures shall provide a degree of protection not less than IP 54 as per IEC.

7.3.4 Panels shall be free standing, floor mounting type and shall comprise rigid welded structural frames enclosed completely with specially selected smooth finished, cold rolled sheet steel of thickness not less than 3mm for front and rear portions and 2mm for sides,

top and bottom portions. There shall be sufficient reinforcement to provide level surfaces, resistance to vibration and rigidity during transportation and installation.

7.3.5 All doors, removable covers and panels shall be gasketed all around with gaskets. Ventilation louvers, if provided, shall have screens and filters. The screens shall be made of either brass or GI wire mesh.

7.3.6 Design, materials selection and workmanship shall be such as to result in neat appearance inside and outside with no welds, rivets or bolt heads apparent from outside, with all exterior surfaces true and smooth.

7.3.7 Panels shall be suitable for floor mounting. Metal sills in the form of galvanized steel channels properly drilled shall be furnished along with anchor bolts and necessary hardware for mounting to a concrete floor. Any irregularity between the sills and flooring shall be sealed to prevent entry of dust, moisture and vermin. Panels shall have additional rolled channel plinth at the bottom with smooth bearing surface. The panels shall be fixed on the sills with intervening materials. The type of anti-vibration strips which shall be supplied by the Contractor shall be subject to the approval of the Employer.

7.3.8 Cable entries to the panels shall be from the bottom unless otherwise specified. The bottom plates of the panels shall be fitted with removable plates of adequate size for holding the cables using cable connectors to seal from dust and moisture. All cable connectors required shall be provided by the Contractor and shall be screwed type and shall be suitable for PVC armored cables.

Control and relay panel enclosure protection class shall be of IP 54. When in closed position there shall not be any chances of entering lizards, mouse etc. inside the panel.

7.4 Component Mounting

7.4.1 All equipment on front of panel shall be mounted flush or semi-flush. In case of semi-flush mounting, only flange or bezel shall be visible from the front.

7.4.2 Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent equipment. Equipment mounted inside the panel shall be so located that terminals and adjacent devices are readily accessible without the use of special tools. Terminal markings shall be clearly visible.

7.4.3 Cut-outs and wiring for free issue items, if any, shall be according to corresponding equipment manufacturer's drawings. Cut-outs, if any, provided for future mounting of equipment shall include cover plates.

7.4.4 The centerline of switches, push buttons and indicating lamps shall be not less than 750mm from the bottom of the panel. The centerline of relays with targets and/or requiring adjustment, motors, test switches, and recorders shall be not less than 450mm from the bottom of the panel. No components shall extend below 200mm.

It will be preferable if existing panel layout is used to give uniform appearances.

7.4.5 The centerline of switches, push buttons and indicating lamps shall be matched to give a neat and uniform appearance. Likewise, the top lines of all meters, relays and recorders, etc. shall be matched.

7.4.6 No equipment shall be mounted on the doors without prior approval of the Employer.

7.4.7 In the existing substation, panels shall be as far as possible matched with the existing panels in the control room in respect of Dimensions, Color, Appearance, Size and Arrangement of equipment on the front.

7.4.8 The standard phase arrangement when facing the front of the switch-board shall be R-S-T from left to right, from top to bottom, and front to back. All relays, instruments, other devices, buses and equipment involving three phase circuit shall be arranged and connected in accordance with the standard phase arrangement.

7.5 Mimic Diagrams

6.5.1 Mimic diagrams shall be provided on panels as required. Mimic diagrams shall be screwed on to panels and shall be made of anodized aluminum or plastic of approved fast color material which can be easily cleaned. The width of the mimic bus shall be subject to approval of the Employer.

7.5.2 The colors for the various voltages in the mimic diagram shall be as per the existing colors.

7.5.3 When semaphore indicators are used for disconnecting switch positions, they shall be so mounted in the mimic that the disconnecting switch's 'close' position shall complete the continuity of the mimic. Similarly, when control switches of stay-put type are mounted in the mimic, the 'close' position of the switch shall complete the mimic.

7.6 Annunciators

7.6.1 Annunciators of the visual and audible type shall be provided on the panels when called for in the equipment lists, if enclosed. Annunciators shall be suitable for operation for the voltages specified.

7.6.2 Annunciators shall be of facia type with 35mm x 50mm (minimum) translucent plastic window for each alarm point. Annunciator facia plates shall be engraved in block letter with respective alarm inscriptions, which will be furnished to Contractor by Employer. Alarm inscriptions shall be engraved on each window in not more than three lines and size of the lettering shall be not less than 3mm. The inscriptions shall be visible only when the respective light is lighted. If any other types of Annunciators are to be used, prior approval from the Owner should be taken before manufacturing.

7.6.3 The annunciators shall be suitable for operation with normally open fault contacts which close on a fault. When specified in bill of materials, some of the annunciator points shall be suitable for operation with normally closed faults contacts which open on a fault. It shall be possible at site to change annunciators from "open to fault" to "close to fault" and vice versa. Annunciators shall be suitable for accepting fleeting faults of duration not less than 15 milliseconds.

7.6.4 Annunciators shall be compact self-contained units with associated relays mounted behind the facia units. In case the associated relays cannot be housed behind the annunciator facia units, these shall be mounted and wired in a separate panel which shall be included in the offer. However, the latter arrangement is not preferred due to additional space requirement and wiring interconnections. Alarm relays and facia units shall be interchangeable.

7.6.5 Annunciator facia units shall be suitable for flush/semi-flush mounting on panels. Replacement of individual facia inscription plates and lamps / LED / LCD shall be possible from front of the panels.

7.6.6 One alarm buzzer common to annunciators on all the panels shall be provided. Similarly, "Sound Cancel", "Acknowledge", "Reset" and "Lamp Test" push buttons common to annunciators on all the panels shall be provided. These common devices shall be located in a particular panel as determined by the Employer.

7.6.7 In case of static annunciator schemes, special precaution shall be taken by the Contractor to ensure that spurious alarm conditions do not appear due to false influence of external magnetic fields on the annunciator wiring and switching disturbances from the neighboring circuits.

7.6.8 Each annunciation window shall be provided with two lamps to provide safety against lamp failure. Lamps shall operate in parallel such that failure of one will not affect operation of the other.

7.6.9 Sequence of Operation of the Annunciator shall be as follows:

Alarm	Condition	Fault	Contact	Audible	Visual Alarm
	Normal	Open		Off	Off
	Abnormal	Close		On	Flashing
	Sound cancel	Close or Open		Off	Flashing
	Acknowledge	Close or Open		Off	Steady On
	Back to Normal	Open		Off	Steady On
	Reset	Open		Off	Off
	Lamp Test	Open		Off	Steady On

In case 'RESET' push-button is pressed before abnormality is cleared, the lamps shall continue to glow steady and shall go out only when 'Normal' condition is restored.

7.6.10 Any new annunciation appearing after the operation of "Sound Cancel" for previous annunciation, shall provide a fresh "Audible Alarm" with accompanied "Visual Alarm" even if the process of "Acknowledging" or "Resetting" of previous alarm is going on or yet to be carried out.

7.6.11 Provision of testing facilities for flasher and audible alarm circuits of annunciators shall be provided.

7.7 Specific Protection Requirements

7.7.1 Relay Protection

7.7.1.1 Overcurrent and Earth fault Protection

i. Non-Directional Phase Overcurrent Protection shall:

- ☐ be single pole & have an inverse characteristic with a definite minimum time of 3sec.at 10times setting.
- ☐ have a variable setting range of 5-250% in step of 1% of rated current
- ☐ have a time multiplier range of 0.025-1 in step of 0.001 for phase fault

ii. Non-Directional Earth Fault Protection shall:

- ☐ be single pole type.
- ☐ have an inverse characteristic with a definite minimum time of 3sec. at 10 times setting.
- ☐ have a variable setting range of 5-250% in step of 1% of rated current
- ☐ have a time multiplier range of 0.025-1 in step of 0.001 for earth fault

7.7.1.2 Directional Overcurrent Protection (not applicable)

i. Phase over current relay shall:

- ☐ be single pole X 3 type
- ☐ have an inverse characteristic with a definite minimum time of 3secs. at 10 times setting.
- ☐ have a variable setting range of 50-200% of rated current.
- ☐ have a characteristic angle of 45 degree.
- ☐ have a directional controlled low transient over-reach high set instantaneous unit of continuously variable setting range 200-1200% times of rated current.
- ☐ be of voltage polarized directional controlled type.

ii. Directional Earth fault overcurrent protection (**Not applicable**)

Earth fault overcurrent relay shall : Single pole type.

be of zero-sequence voltage polarized directional controlled.

have an inverse characteristic with a definite minimum time of 3 secs. at 10 times setting.

have an adjustable setting range of 10-80% of rated current.

have a directional controlled low transient over reach high set with a continuously variable setting range of 5-20 times of rated current.

have a characteristics angle of 45 degree.

7.7.1.3 Local Breaker Back Up Protection

Relay shall:

- be triple pole type.
- have an operating time of less than 15 milliseconds.
- have 2 over current and 1 Earth fault elements.
- have a re-setting time of less than 15 milliseconds.
- have a setting range of 30-320% of rated current.
- have a separate time delay relay with a continuously adjustable setting range of 0.1-1 second.
- have necessary auxiliary relays to make a comprehensive scheme.
- have a continuous thermal withstand two times rated current irrespective of setting.
- provide both retrip and back-up trip output contacts.

7.7.1.4 Differential Relay

The Differential Relay shall be used for 6/8 MVA transformer Protection. It shall be of Three phase with Six through current restraint inputs. The Relay shall have built in trip relay, indicator & test switch. It shall have complete phase and Earth fault Protection.

The Harmonic restrained operation time of the Relay shall be Approximately 30ms at 3times of pickup current. Similarly, unrestrained operation time shall be 10-20ms at 2times pickup current with minimum impulse time of 3minutes.

The Relay shall have variable percentage restraint for external fault, even at use of OLTC.

The Relay shall have second harmonic restraint from all the three phases for inrush security & fifth harmonic restraint for all three phase for over excitation security. The sensitivity shall be settable to 10 - 50% of rated

current of 1A.

Un-restrained operation settable to 20 times of rated current.

The relay shall be provided with separate interposing CT for ratio and Phase Angle matching and equalizing of zero sequence current, or by other programming method.

7.7.2 Manufacturer of Protection Relay shall be as specified

7.7.3 Other Requirements

i. Layout of panel in the control room, individual panel layout incorporating the hardware and control wiring diagrams and schematics shall be prepared by the Contractor and be sent to the Employer for approval.

ii. All auxiliary relays, if and when required for the completeness of the various protection schemes covered in this order, shall be deemed to be included in the scope of supply whether or not such items are specifically mentioned in the enclosed bill of material.

ii. Omission of hardware specifically mentioned in Price schedule material such as auxiliary relays/protective relays, etc. if found necessary during detailed engineering shall be shipped to the Employer with spare parts, without any extra cost to the Employer.

iv. All terminal blocks for CT and PT circuits shall be of disconnecting line type. Suitable plastic covers for all terminal blocks shall be provided in order to prevent dust accumulation.

v. Panels shall be mounted to concrete foundation on galvanized steel channels with an intervening layer of anti-vibration strips made of shock absorbing materials which shall be supplied by the Contractor.

vi. Cable entries for all the panels shall be from bottom. The bottom plates of the panels shall be fitted with removable plates of adequate size for holding cables and sealing from dust and moisture.

viii. A ground bus of bare copper strip of minimum size 25 x 6mm along the length of each panel shall be provided and shall be connected to the ground mat of the station.

APPENDIX: 1.4 .1

BILL OF MATERIAL

The bill of materials shall cover only the major equipment or such information as will require particular information from the Bidder. Bidder is to be understood that, all other associated auxiliary equipment and accessories, although not listed in the bill of materials, but necessary for the complete and sound function of the control board as described in this specification, shall be furnished by the Contractor.

LINE & TRANSFORMER CONTROL & RELAY PANEL

1. Major Components

	Legend	Description	Quantity per Panel
1.	ANN	Annunciator assembly, 24 active points, 110V DC, 4 rows high by 6 columns wide, flush mounted, and with: 3-separately mounted push buttons 2-separately mounted indicating lamps, one white lamp, and one red lamp Following minimum annunciation shall be provided: 1. Transformer HV Backup Protection trip 2. Transformer LV Backup Protection trip 3. Transformer Differential Protection trip 4. Transformer Buchholz Alarm / Trip 5. Transformer Low Oil Level 6. Tap Changer Buchholz Alarm / Trip 7. Tap Changer Low Oil Level 8. Circuit Breaker Trip 9. Transformer Winding Temperature High 10. Transformer Winding Temperature Extra High 11. Tap changer Temperature High	1 Lot
		12. Tap changer Out of Step	
		13. Transformer Cooling System Fail	
		14. Pressure Relief Device Operated	
		15. AC Fail	
		16. DC Fail	
		17 –22. Spare	
2.	m Relay	main relays and instruments are listed here. All the trip relays and auxiliary relays required for satisfactory operation of the scheme shall be included by the Contractor.	
2.1	50/51/50N/ 51N	current and Earth Fault Protection with Instantaneous Protection	1 Lot
2.2	50B	Breaker Failure Protection	1 Nos
2.3		Trip circuit supervision relay	1 Nos

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

2.4	51E	Transformer Protection	1 Nos
2.5	87	Differential Relay	1 Nos
2.6		Interlocks, Switching & Tripping Relay	1 Lot
3.	A	Indicating ammeter, Digital 0-100A; 0-200A;0-400 400-200-100/5A	3 Nos
4.	MWH	Electronic type with 0.2 Class	1 Nos
5.	P.F.	Power factor 0.6-1-0.6 lead	1 Nos
6.	KVA	0-16.6 MVA	1 Nos
7.	CS	Breaker control switch, and with: 2-separately mounted indicating lamps,	1 Nos
8.	CS	necting control switch, and with: 2-separately mounted indicating lamps	1 Nos
9.		cally operated mimic disconnect device, 110V DC, to indicate the position of disconnecting switch	1 Lot
10.		cally operated mimic connected to position of line ground switch	1 Lot
11.		ransfer Switch, for transferring trip signal, reclosing relay, PT circuit to bus tie Breaker. (wherever required)	1 Lot
12.		le Adjustable Ratio Intermediate Current Transformer for Differential Protection, if required	1 Set

6.8 ENERGY METERS

1. Scope

This specification covers the design, engineering, manufacture, assembly, testing and delivery at site of CT and VT operated A.C. static watt hour meter. The meters shall be 3- Phase 4 wire of 0.2 accuracy class for measurement of active, reactive (lead & lag) and apparent power and energy as per power tariff requirement of A.C. balanced and unbalanced load at nominal frequency in the range of 47.5Hz to 52.5Hz using Digital Technology. Meter shall be manufactured using latest and 'state of art' technology and methods prevalent in electronic industry.

It is not the intent to specify completely herein all the details of the hardware, software, communication and design of the system. The material shall, however, conform in all respects to the best standards of engineering, design and workmanship and shall be capable of performing for continuous commercial operation.

2. Service Conditions

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

Environmental Condition

- | | | |
|----|--|--------------------------------------|
| a) | Maximum ambient temperature | -5 to 55 ⁰ C |
| b) | Maximum ambient temperature in shade | 45 ⁰ C |
| c) | Minimum temperature of air in shade | 35 ⁰ C |
| d) | Maximum daily average temperature | 40 ⁰ C |
| e) | Maximum yearly weighted average temperature | 32 ⁰ C |
| f) | Relative Humidity (%) | 10 to 95 |
| g) | Maximum Annual rainfall (mm) | 1450 |
| h) | Maximum wind pressure (Kg/m.sq) | 150 |
| i) | Maximum altitude above mean sea level (meters) | Upto 2000 |
| j) | Isoceraunic level (days/year) | 50 |
| k) | Seismic level (Horizontal acceleration) | 0.3g |
| l) | Climate: - Moderately hot and humid tropical climate | conducive to rust and fungus growth. |

The meters should be designed for tropical condition and shall be constructed to be capable of withstanding all severe stresses and vibrations and dust environments likely to encounter in actual practice.

3. Applicable Standards, Accuracy and Certification

The meters shall conform (for testing, performance and accuracy) in all respects the relevant /International standards with latest amendments thereof.

S.No	Standard No.	Title
1.	IEC 62053-22 Ed. 1.0 B-2003 with latest amendment.	A.C. Static Watt-hour Meters For Active Energy, Class 0.5 s

There should be no drift of accuracy, which means that the initial accuracy is sustained over the entire life of the meter and there should be no need for adjustment of the accuracy after installation.

The manufacturer of the offered meter must have been accredited with ISO 9001 (including design) quality certification.

4.0 Rating & Type of Service

The energy meters shall be outdoor type connected with the secondary side of out door current and voltage transformers.

S.No	Item	Specification
i)	Type of Installation	Outdoor, encased within metallic box
ii)	CT Secondary	5 A
ii)	VT Secondary	For 3 Phase 3 Wire and 4 Wire (HT Metering): 110 V/ $\sqrt{3}$ Volts (Phase to Neutral) 110 V Volts (Phase to Phase) For 3 Phase 4 Wire (LT Metering): 400 V/ $\sqrt{3}$ Volts (Phase to Neutral) 400 V Volts (Phase to Phase) The voltage range shall be +15% to – 40% of voltage (Secondary side of Voltage Transformer).
S.No	Item	Specification
iv)	Power Factor range	Zero Lag-Unity-Zero Lead.
v)	Power consumption	As per IEC62053-22–2003 with latest amendment.
vi)	Frequency range	50Hz $\pm$ 5%
vii)	Earthing System	Solidly Grounded

The maximum continuous current of the meter for guaranteed accuracy is 1.2 times (120 %) of I_b . The starting current for the meter should be 0.1% of I_b . The meter shall not register with no-load. It should also meet the requirements of withstanding short time over current for 1.0 second up to 20 times I_b . The meter shall be suitable for balanced as well as unbalanced loads at all power factors. Unbalance in load should not affect the accuracy of meter.

5.0 General and Constructional Requirements

The meter should be housed in a safe high grade Thermo engineering plastic/ polycarbonate casing and is dust/moisture proof conforming to IP: 51. The meter cover should be made up of moulded flame retardant

polycarbonate, which is tough, resilient and can be fixed up with the help of screws. Provision should be made for sealing the cover also.

The meter shall have Poly –carbonate opaque base and cover of Poly-carbonate material. The thickness of material for meter cover and base shall be 2 mm (minimum).

The terminal block should be made out of moulded Bakelite/ polycarbonate and should house solid brass terminals with 2 fixing screws per terminal. The terminals should be liberally designed to permit high overload withstand capability. The engineering plastic used for terminal block and cover shall withstand the heat deflection test as per ISO: 75 and Glow wire test as per IEC: 62053-22.

The terminal block should have cover which should be separately sealable at two places and housed at the bottom of the meter and once sealed should prevent unauthorized tampering.

The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor with the help of two screws.

Dust proof window of any transparent material (Toughened glass or poly carbonate), which shall not fade in prolonged use, shall be provided to permit clear view of the register. The fixing arrangement shall be such that the window glass cannot be removed without breaking the seals.

The extended terminal cover shall be transparent.

Meter shall be designed in such a fashion that it should be installed in a separate box (surface type) which may be fixed on the electric pole in outdoor condition.

All the insulating materials used in the construction of the meter shall be of non- hygroscopic, non-ageing and of tested quality.

The entire design and construction shall be capable of withstanding the severest stress likely to occur in actual service. The soldering shall be perfect without dry solders.

All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.

The meters shall be designed with application of specific integrated circuits. The electronic components shall be mounted on the printed circuit board using latest Surface Mount Technology (SMT).

The meter shall have a suitable test output device for testing meter. Preferably the blinking LED or other similar device like blinking LCD shall be provided. The test output device should have constant pulse rate i.e. Pulse/kWh and its value (meter constant) should be indelibly printed on the name plate.

The Push button shall be provided for high resolution reading of display, as brought out elsewhere in this specification.

The meter accuracy shall not be affected by AC/DC magnetic field up to 0.2 Tesla on all the sides of meter i.e. front, sides, top and bottom of the meter. Moreover, meter accuracy shall not be affected if permanent magnet of 0.5 Tesla is applied for 15 minutes.

The meter shall also be capable to withstand and shall not get damaged if phase to phase voltage is applied between phases & neutral for five minutes.

Non specified display parameter in the meter should be blocked and it should not be accessible for reprogramming at site.

Complete metering system should not be affected by the external electromagnetic interference such as electrical discharge of cables and Capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The meter shall withstand any type of High Voltage and High Frequency surges which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter. The manufacturers should have type test certificates for the same.

The meter should have facility for data retrieval through optical port using CMRI and Laptop PC and RS232 communication port for remote meter reading facility.

The meter PCB should be wireless to avoid improper and loose connections/ contacts.

Sealing

Proper sealing arrangement shall be provided on the meter to make it tamper proof and to avoid mishandling by un-authorized person. At least two (2) seals on the body, two (2) seals on the terminals block and one seal each on maximum demand resetting device and communication ports shall be provided. Meter base and cover shall be tightened from rear side with at least two nos. so that meter body could not be opened at site in any case and two nos. firms' stickers seals bearing serial no., which should not be repeated shall be provided between meter base and cover.

The meter shall be totally sealed and tamper-proof with no possibility of any adjustment at site.

6. Connection Diagram & Terminal Marking

The connection diagram of the metering module shall be clearly shown inside portion of the terminal over and shall be of permanent nature. The meter terminals shall also be marked and this marking should appear in the above diagram. In case any special precautions need to be taken at the time of testing the meter the same may be indicated along with the circuit diagram.

7. Marking of Meter:

The marking on every meter shall be in accordance with IEC 62053. The basic marking on the meter name plate shall be as follows: -

- | | | |
|-------|--------------------------------------|------|
| i | Manufacturer's name and trade mark. | ii. |
| | Type designation | |
| iii. | Number of phases and wires | |
| iv. | Serial number | |
| v. | Month & year of manufacture | |
| vi. | Reference voltage/ PT ratio | vii. |
| | Frequency | |
| viii. | Rated secondary current of CT (5 A). | |
| ix. | Principal unit(s) of measurement. | |
| x. | Meter constant (impulse/kWh). | |

xi. Class index of meter.

8. Real Time Clock

The real time quartz clock shall only be used in the meter for maintaining time (NS) and calendar. The time accuracy shall be as per provision of relevant IEC Standard. Facility for adjustment of real time should be provided through CMRI and Laptop with proper security.

9. M.D. Registration and Demand Resetting

9.1. The meter shall continuously monitor & calculate the average demand in kVA during the Integration period and maximum out of these shall be stored along with date & Time in the meter's memory. The integration period shall be programmable for 15/30/60 minutes on real time basis on block / sliding window principle that should also be programmable.

9.2 The meter shall also display M.D. reset count. The M.D. resetting should be possible in following way: -

a. Automatic reset on a predetermined date & time of the month.

9.3 Meter should measure energy of 4 quadrants & it should have the ability of measuring & recording Import/Export active & reactive energy separately for each quadrant.

9.4 The meter should measure import export energy as well as value of active energy & it should be possible to activate this capability.

The meter should be capable of measuring fundamental energy as well as total energy. Fundamental energy shall be made available on meter-display & the same only shall be used for billing purpose.

10. T.O.D. Compatibility

There shall be provision for at least 8 (Eight) different TOD register at least in 6 channels for maximum demand kVA, kWh and kVARh. Similarly, there shall be provision for at least 4 (Four) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable from base computer as per the requirements of Employer.

11. Self-Diagnostic Features.

11.1 The meter shall be capable of performing complete self-diagnostic check at regular interval to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time. The meter shall also keep log in its memory for unsatisfactory functioning or nonfunctioning of Real Time Clock battery, also it shall be recorded and indicated in reading file at base computer software.

11.2 All display segments: "LCD Test" display shall be provided for this purpose.

12. Display of Measured Values

12.1 Permanently backlit LCD panel shall show the relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 12 years. In

the case of multiple values presented by a single display it shall be possible to display the content of all relevant memories. When displaying the memory, the identification of each parameter applied shall be possible. The principal unit for the measured values shall be the kilowatt hour (kWh) for active energy, kVARh for reactive energy and kVAh for apparent energy.

12.2 The display shall be minimum full 8 excluding decimal or more digit type display of liquid crystal display (LCD). The display shall be digital type with non-destructive read out. The meter should have non-volatile memory (NVM) so that the registered parameters will not be affected by loss of power. An additional LCD display should show the legend of the quantity. The size of digit should be minimum 9X5 mm. The adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided. The meter should have alternate display modes for showing required information. Default mode should be auto scroll type. The number of parameters and the scrolling period shall be field programmable. In alternate mode, required parameters should be displayed and should be possible to view the parameters using push button.

12.3 There shall be arrangement for displaying of consumer ID, consumer no name and address for which record number field should be at least of 8 digits.

12.4 The meter shall be capable of recording and displaying automatically the following:

Display Parameters (Auto Display)

Following parameters shall be displayed continuously in cyclic order on the meter face to enable NEA to know the parameter at any instant. The time for display shall be programmable and shall not drift throughout the life cycle of meter.

1. Active and Reactive Power, kW & kVAR (forward and reverse)
2. Cumulative Active Energy, kWh (forward and reverse)
3. Cumulative Reactive Energy, kVARh (forward and reverse)
4. Cumulative Apparent Energy, kVAh (forward and reverse)
5. TOD Active Energy, kWh (forward and reverse)
6. TOD Reactive Energy, kVARh (forward and reverse)
7. TOD Apparent Energy (kVAh) (forward and reverse)
8. Maximum Demand kVA since Reset (forward and reverse with occurrence, Date & Time)
9. M.D. Reset Count
10. Last month MD (between reset)
11. Date of last month MD reset
12. Cumulative MD
13. Instantaneous Power Factor
14. Line Frequency
15. Instantaneous phase currents
16. Phase voltage (Instantaneous)
17. Real time & date
18. Self-diagnostic (LCD) segment check and Battery check
19. CT & PT Ratio

Display Parameters (Push Button)

After using pushbutton, the following parameters should be displayed.

1. Active and Reactive Power, kW& kVAR (forward and reverse)
2. Cumulative Active Energy, kWH (forward and reverse)
3. Cumulative Reactive Energy, kVARH (forward and reverse)
4. Cumulative Apparent Energy, kVAH (forward and reverse)
5. TOD Active Energy, kWH (forward and reverse)
6. TOD Reactive Energy, kVARH (forward and reverse)
7. TOD Apparent Energy (kVAH) (forward and reverse)
8. Maximum Demand kVA since Reset (forward and reverse with occurrence, Date & Time)
9. M.D. Reset Count
10. Last month MD (between reset)
11. Date of last month MD reset
12. Cumulative MD
13. Instantaneous Power Factor

- 14. Line Frequency
- 15. Instantaneous phase currents
- 16. Phase voltage (Instantaneous)
- 17. Real time & date
- 18. Self-diagnostic (LCD) segment check and Battery check
- 19. CT & PT Ratio

NOTE: The meter display should return to Default Display mode (mentioned above) if the ' Push button ' is not operated for more than 15 seconds.

12.5 The meter should be capable of measuring fundamental energy as well as total energy.

12.6 Maximum Demand Integration Period: - Integration period for kVA MD should be of 30 minutes real time based. However, it shall be programmable to 15 minutes if required.

13. Memory

The data stored in the registers should not be lost in the event of power failure and the meter should have non-volatile memory, which does not even need battery back-up. Each meter shall have a non-volatile memory and the data stored on the NVM should be retained upto twelve years without power.

Following monthly data should be stored for 12 months in the non-erasable memory along with the name of the month and shall be accessible for reading through Lap Top.

- i. Active energy import, kWh
- ii. Active energy export, kWh
- iii. Maximum Demand, kVA in both directions
- iv. Average power factor or kVARh
- v. Average frequency for each successive 15-minute block
- vi. Reactive Energy Import
- vii. Reactive Energy Export

14. Billing History and Load Survey

The meter shall have sufficient non-volatile memory for recording history of following billing parameters and load survey.

14.1 Monthly records for billing

Following monthly data should be stored for at least 12 months (FIFO) with date & time of Reset in the non-erasable memory along with the name of the month and shall be accessible for reading through Lap Top.

- a. Cumulative Active energy, kWh Forward Direction
- b. TOD Active energy, kWh Forward Direction

- c. Cumulative Active energy, kWh Reverse Direction
- d. TOD Active energy, kWh Reverse Direction
- e. Maximum Demand, kVA
- f. Consumer Number
- g. CT & PT Ratio
- h. Meter Serial Number

14.2 Load survey parameters: -

Storage in non-volatile memory for more than 180 days with 30 minutes time integration period of the following parameters – kWh / kW, kVAh / kVA, Phase wise currents, Phase Voltages, Average Current, Average Voltage, Power Factor–shall be provided on non-time based basis. Whenever meter is taken out and brought to laboratory the L/S data shall be retained for the period of actual use of meter. This load survey data can be retrieved as and when desired and load profiles shall be viewed graphically / analytically with the help of meter application software. The meter application software shall be capable of exporting / transmitting these data for analysis to other user software in spreadsheet format. The time required for downloading this data should be as minimum as possible.

15. Tamper and Fraud Detection/Evidence

The meter shall detect and correctly register energy only in forward direction under following tamper conditions:

15.1 The meter accuracy shall not be affected by change of phase sequence. It should maintain the desired accuracy in case of reversal of phase sequence.

15.2 The meter should continue to work even without neutral.

15.3 The meter should work in absence of any two phases i.e. it should work on any one phase wire and neutral, to record relevant energy. It should also work with two phases in case of missing neutral.

15.4 The meter should keep registering correct energy when all the CT polarities are reversed.

15.5 The meter shall not get damaged or rendered non-functional even if any phase and neutral are interchanged.

15.6 Tamper Events

The meter should have features to detect the occurrence and restoration of the following abnormal events.

Missing potential and potential imbalance

The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of potential failure and low potential, which could happen due to disconnection of potential leads (one or two). The log report should contain the date, time, TOD energy, Consumer Number and the Meter Serial Number. The threshold time for the recording of such events should be programmable and at least 300 sec.

Current unbalance

The meter shall be capable of detecting and recording occurrence and restoration with date and time of current unbalance (30% or more for 15 minutes). Higher of the 3 phase currents shall be considered as reference for this purpose.

Current Reversal

The meter shall be capable of detecting and recording occurrence and restoration with date and time of reversal of current with phase identification.

Power ON / OFF

The meter shall be capable to record power ON/OFF events in the meter memory. All potential failure should record as power off event.

Current circuit short

The meter shall be capable of detecting and recording occurrences and restoration of shorting of any one or two phases of current.

The meter shall keep records for should keep record of at least **500** such tamper events all the events (Occurrence + Restoration). For above abnormal conditions the recording of events shall be on FIFO basis. It shall be possible to retrieve the abnormal event data along with all related snap shots data through the meter optical port with the help of CMRI & downloaded the same to the base computer. All the information shall be made available in simple & easy to understand format.

16. Data Communication Capability

The meter shall be provided with two ports for communication of the measured/collected data as per the guideline document for DLMS/COSEM energy meters:

16.1 Each meter shall have an optical port on its front for tapping all data stored in its memory. Portable or hand held data collection devices/ Lap Top PC shall be used for this purpose. The overall intention is to tap the data stored in the meter's memories once in a month, and transmit the same to a central computer. It shall also be possible to obtain a print out (hard copy) of all data collected from the meters, using the local PC. The data transfer should be reliable and fraud proof.

16.2 Additionally, the metering system shall have a serial RS232 port for transferring the meter data to a remote location via a suitable communication infrastructure.

Meter shall have an additional communication port (RS 232/485) for periodic data transfer by remote

access through suitable modem (GPRS/GSM/EDGE/CDMA/PSTN/LPR). Meter shall operate on open DLMS protocol and will be individually addressable. Meters with similar kind of RS 485 ports shall be possible to hook up in multi-drop arrangement for exporting data to the remote end server through suitable communication medium. Both ports shall support the default and minimum baud rate of 9600 bps.

16.3 The metering system shall be compatible with suitable Base Computer software.

16.4 All meters of the same model shall be totally identical in all respects except for their unique identification codes. They shall also be totally sealed and tamper proof, with no possibility of any adjustment at site, except for clock correction.

16.5 There shall be magnetic device at optical port to hold up one end of communication cable (used to download the data to Lap Top). The bidder shall supply a minimum of 2 numbers of optical probe for connection with the Lap Top computers. The price of the optical probe shall be included in the price of the meter itself.

17. Software:

The purchaser shall have the right to use the software as required for the operation of the meter. The supplier shall not charge extra costs for the use of the software. Further, the software should be able to display the three-phase voltages and current waveforms measured by the meter. It should be able to display the phasor diagram.

The following software shall be supplied by the meter manufacturer without any extra cost.

17.1 Software for reading and programming the meter contents through CMRI/Laptop Computer.

17.2 Base Computer software for accepting data from CMRI and downloading instructions from Base Computer to MRI.

17.3 Base Computer should have facility to program the display and/or other required parameters in the meter.

17.4 The meters should be capable to communicate directly to Lap Top Computer.

17.5 The base computer software shall be executable on MS Windows XP/ win 7/ Win 8/ Win 8.1 or latest versions with 32/64-bit architecture.

17.6 For efficient and speedy recovery of data downloaded through CMRI/Laptop PC on base computer, licensed copies of base computer software shall have to be supplied.

17.7 The base computer software shall be Window based & user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer by any means).

17.8 The protocol used in the meter shall have to be provided at the time of supply for the purpose of Automatic Meter Reading System. The Suppliers shall also have to submit the protocol for meters supplied in the past and ensure that protocol corresponds to the type of meter supplied. The protocol shall be shared by NEA.

17.9 Security Features

Communication session count should be available through display and with Lap Top.

The meter should log the date and time of at least last five program changes in a billing period.

The meter should have programmable facility to restrict the access to the information recorded at different security level such as communication read, communication write etc.

17.10 The Supplier or Manufacturer shall provide a software for generating a report in concise and desired format so that these can be used for billing, meter data management, outage management etc.

18. Additional Features

18.1 External Power Supply

Meter shall be provided with super capacitor and battery. The rated shelf life of battery shall be of 15 years. Super capacitor will provide carry over power for all normal power outages at least for 36 hr. duration. Battery will work when super capacitor is discharged or when programmed meter is stored for extended period without electric supply. No auxiliary supply should be required for the meter.

18.2 Meter Calibration

The meter should have a blinking LED, which blinks and is analogous to the rotation of the disk in an electro-mechanical meter for calibration of kWh. The watt-hour per pulse constant is definable by the manufacturer.

18.3 Recovery of Data

The meter shall have provision to communicate with the CMRI/PC even in event of failure of display. In event of failure of component affecting more than just LCD function, manufacturer shall extract the stored data at no cost to the purchaser during the warranty period. All the cost (including transportation to and fro) involved in the process shall be borne by the supplier. Similarly, the memory of the meter shall be suitably protected and secured against unexpected fault conditions.

18.4 Connection Check

The meter should have capability to check the correctness of connections at site.

18.5 Missing Voltage Indication

There shall be visual display of the missing voltage on the face of the meter.

19. Miscellaneous Accessories

19.1 Space Heater

Each panel shall be equipped with space heaters to prevent moisture condensation within the enclosure and

shall be completed with switch fuse units for power supply. Space heaters and switch fuse units shall be suitable for continuous operation.

19.2 Plug Point

A 230 V, 1 phase, 50Hz AC plug point shall be provided in the interior of each cubicle with on-off switch for connection of hand lamps.

19.3 Tests

19.3.1 Relay and Control Panels shall be subjected but not limited to the following tests:

- i. Mechanical operation test
- ii. Verification of degree of protection
- iii. Calibration test for meters
- iv. Characteristic test for relays
- v. High voltage test of insulation (2000 volts for 1 minute)
- vi. Electrical control, interlock and sequential operation tests
- vii. Verification of wiring as per approved schematic diagram.

19.3.2 Type tests and routine tests shall be carried out on all associated equipment as per relevant standards approved by the Employer.

19.3.3 Certified copies of all type and routine test certificates shall be submitted for the Employer's approval before dispatching the control and relay panel.

19.3.4 After completion of the installation, panels shall be subjected but not limited to the following field tests:

- i. Electrical control, interlock and sequential operation tests
- ii. Calibration test for meters
- iii. Measurement of insulation resistance
- vi. Characteristic test for relays

19.3.5 Transformer Protection

33/11 kV, 6/8 MVA transformer shall be protected by the following relays

- a Over current relay
- b Earth fault relay
- c Differential relay
- d Definite over current relay (if applicable)

APPENDIX: 1.4 .1

BILL OF MATERIAL

The bill of materials shall cover only the major equipment or such information as will require particular information from the Bidder. Bidder is to be understood that, all other associated auxiliary equipment and accessories, although not listed in the bill of materials, but necessary for the complete and sound function of the control board as described in this specification, shall be furnished by the Contractor.

TRANSFORMER CONTROL & RELAY PANEL

1. Major Components

	Legend	Description	Quantity per Panel
1.	ANN	Annunciator assembly, 24 active points, 110V DC, 4 rows high by 6 columns wide, flush mounted, and with: 3-separately mounted push buttons 2-separately mounted indicating lamps, one white lamp, and one red lamp Following minimum annunciation shall be provided: 1. Transformer HV Backup Protection trip	1 Lot
		2. Transformer LV Backup Protection trip	
		3. Transformer Differential Protection trip	
		4. Transformer Buchholz Alarm / Trip	
		5. Transformer Low Oil Level	
		6. Tap Changer Buchholz Alarm / Trip	
		7. Tap Changer Low Oil Level	
		8. Circuit Breaker Trip	
		9. Transformer Winding Temperature High	
		10. Transformer Winding Temperature Extra High	
		11. Tap changer Temperature High	
		12. Tap changer Out of Step	
		13. Transformer Cooling System Fail	
		14. Pressure Relief Device Operated	
		15. AC Fail	
		16. DC Fail	
		17 –22. Spare	
2.	Relay	Only main relays and instruments are listed here. All the trip relays and auxiliary relays required for satisfactory operation of the scheme shall be included by the Contractor.	
2.1	50/51/50N/51N	Over current and Earth Fault Protection with Instantaneous Protection	1 Lot

2.2	50B	Breaker Failure Protection	1 Nos
2.3		Trip circuit supervision relay	1 Nos
2.4	51E	Transformer Protection	1 Nos
2.5	87	Differential Relay	1 Nos
2.6		Interlocks, Switching & Tripping Relay	1 Lot
3.	A	Indicating ammeter, Digital 0-100A; 0-200A 300-200-100/1A	3 Nos
4.	MWH	Electronic type with 0.2 Class	1 Nos
5.	P.F.	Power factor 0.6-1-0.6 lead	1 Nos
6.	KVA	0-10 MVA	1 Nos
7.	CS	Breaker control switch, and with: 2-separately mounted indicating lamps,	1 Nos
8.	CS	Disconnecting control switch, and with: 2-separately mounted indicating lamps	1 Nos
9.		Electrically operated mimic disconnect device, 110V DC, to indicate the position of disconnecting switch	1 Lot
10.		Electrically operated mimic connected to position of line ground switch	1 Lot
11.		Trip Transfer Switch, for transferring trip signal, reclosing relay, PT circuit to bus tie Breaker. (wherever required)	1 Lot
12.		Multiple Adjustable Ratio Intermediate Current Transformer for Differential Protection, if required	1 Set

8. Cables

8.1 General

This specification covers the design, manufacture, factory test, supply, delivery, field test and installation of all Power, Control and Instrumentation cables required for the entire project.

Manufacturer of 36 & 12kV power cable shall be holder of valid ISO 9001 Certificate (Including Design)

8.2 Equipment to be furnished:

- a. 12 kV XLPE Power Cable
- b. 600 volt power cable
- c. Control and instrumentation cable
- d. Communication cable

8.2.1 The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

8.2.2 The Contractor shall be responsible for estimating and supplying the quantity of various types and sizes of the cables. In course of actual execution if it is found that additional cross-section, types or quantities of cables are required than those indicated in his proposal, the same shall be supplied without any additional charge to the Employer.

8.3 Design Requirement

8.3.1 12kV power cable

(a) General

The 12 kV power cable shall be cross linked polyethylene insulated, shielded and armored cable.

(b) Conductor

Conductor shall consist of stranded annealed copper wires. They shall comply with IEC Publication. The maximum conductor temperature shall be 90 deg. C.

(c) Current rating

The maximum current rating for the cable routes and conditions of installation shall be stated for 12 kV power cable by the Contractor.

(d) Anti-termite covering

Anti-termite protection shall be applied to the cable and shall consist of a non- magnetic metallic barrier.

(e) Outer covering

The outer covering of the cable shall be extruded, continuous black PVC suitable for the operating

temperature of cable and shall meet the requirements of IEC standard.

(f) Cable drum

Cable drum shall be non-returnable and shall be made of timber, pressure impregnated against fungal and insect attack. Alternatively cable drum may be made of steel suitable protected against corrosion.

(g) Outdoor and indoor termination for high voltage cable.

Outdoor and indoor termination shall be done by heat or cold shrinkable type termination kits.

Termination for cable shall be provided in sufficient quantities for complete installations of substations.

(h) Jointing accessories

Cable shall be installed in maximum possible length and straight through jointing between shorter lengths will not be permitted without the prior written authority of the Employer/Employer's Representative. Jointing accessories for stranded copper conductor cables shall be designed for identification ferrules.

(i) Voltage identification

The plastic over sheath shall be embossed with the name of the manufacturer, name of the Employer, number of conductors, the cross sections, type of insulation followed by:

Electric cable - 12,000 volts

(j) Phase identification

Phase identification for either triplexed or multi conductor cable shall be in accordance with follows:

- Phase A (R): Red
- Phase B (S): Yellow
- Phase C (T): Blue

8.3.2 1100 volt PVC insulated cable. (a)

General

The low voltage cables shall be 1100v grade polyethylene insulated, armored and PVC sheathed. Low voltage power cables shall be suitable for grounded neutral with phase to phase voltage level of 400V and phase to neutral voltage of AC system and 110V DC system.

(b) Conductor

Conductor shall consist of stranded annealed copper wires. They shall comply with IEC publication. The cable is intended for use at normal conductor operating temperatures not exceeding 75 deg.C.

(c) Insulation

The electrically and thermally stable polyethylene insulation shall be extruded onto the conductor so as to prevent contamination and voids in the insulation.

(d) Current rating

The maximum continuous current rating for the cable routes and conditions of installation shall be stated for low voltage power cable by the Contractor.

(e) Anti-termite covering

Anti-termite protection shall be applied to the cable and shall consist of a non-magnetic metallic barrier.

(f) Jacket

The cable core assembly shall be covered with a flame retardative and moisture resistant PVC jacket, which is free-stripping from the insulation. The overall jacket shall be clean, dry, and free of grease and shall be suitable for ink or paint application.

(g) Identification

Each cable shall have a printed legend on the overall jacket with a manufacturer's name, name of the Employer, voltage class, the number and size of conductors, type of insulation.

The colors for core identification and color sequence shall be in accordance with follows:

- Single-core: Black
- Twin: Red and black
- Three-core: Red, yellow and blue
- Four-core: Red, yellow, blue and black

8.3.3 Control and instrumentation cable

(a) General

All control and instrumentation cable shall be 600V grade as per IEC multicore, color-coded, PVC insulated, cable armored cable. Each multicore cable shall have not less than 20 percent or 4 spare cores whichever is the greater.

(b) Conductor

Copper conductor shall be stranded circular non-compacted copper conductor of minimum cross-section of 2.5 sq. mm.

(c) Insulation

The electrically and thermally stable PVC insulation shall be extruded onto the conductor so as to prevent contamination and voids in the insulation.

(d) Assembly

Multi conductor cables shall be assembled in accordance with applicable IEC standard.

A flame retardative binder tape may be used underneath the overall jacket of multi- conductor cables, if required to achieve the desired flame retardative characteristics. Tapes, if used, shall be non-hygroscopic.

(e) Anti-termite covering

Anti-termite protection shall be applied to the cable and shall consist or a non-magnetic barrier.

(f) Jacket

The cable core assembly shall be covered with a flame retardative and resistant jacket, which is free-stripping from the insulation.

The overall jacket shall be clean, dry, and free of grease and shall be suitable for ink or paint application.

Cable jacketing and the interstices within the jacket shall be free of water. Evidence of water shall be grounds for rejection of the cable.

(g) Identification

Each cable shall have a printed legend on the overall jacket, with the manufacturer's name, name of the Employer, voltage class, the number and size of conductors, and a unique number or code indicating the production run or batch. The identification shall remain legible for the life of the cable.

8.4 Special Requirement

Small cut piece lengths of cables will not be accepted. Cables up to 500 meters in length or as approved by Employer/Employer's Representative shall be of one length shipped in a drum of adequate size. For higher quantities, multiple lengths/drums may be shipped subject to the approval of Employer/Employer's Representative.

8.5 Drawings, Data & Manuals

The following information shall be furnished along with the Tender.

- (a) Manufacturer's leaflets giving constructional details, dimensions and characteristics of different cables.
- (b) Current rating of cables including de-rating factor due to grouping, ambient temperature and type of various installation.
- (c) Write-up with sketches illustrating the manufacturer's recommendation for splicing, jointing and termination of different types of cables.
- (d) Type test report of all types of power, control and instrument cables. The Bidder shall clearly describe the type and routine tests to be performed on cables.

- (e) Drum length for each type of cable.

8.6 Tests

8.6.1 Routine and design tests

Routine test in accordance with the provision of standard as listed in Sub-Clause 2.3 of Section IVA shall be carried out for each drum of cable.

Type test and acceptance test as per standards as listed in Sub-Clause 2.3 of Section IVA shall have to be carried out to prove the general qualities and design of a given type of cable and for the purpose of acceptance of the lot. The test certificate shall be approved by Employer/Employer's Representative before shipment.

The following tests shall be included in the routine test by the manufacturer at the factory as minimum requirements for this specification:

- (a) Construction inspection
- (b) Conductor resistance test
- (c) High voltage test
- (d) Insulation resistance test
- (e) Physical and aging test for insulation and jacket

8.6.2 Field tests

After installation at site, cables shall be subjected but not limited to the following tests: (a)

Measurement of insulation resistance

- (b) DC dielectric test

8.7 Performance Guarantee

The performance figures quoted on schedule of Technical Data shall be guaranteed within the tolerance permitted by relevant standard and shall become a part of the Contract. In case of failure of the cables to meet the guarantee, the Employer/Employer's Representative reserve the right to reject the equipment. The Contractor shall have to rectify the defect t no extra cost to the Employer and without delaying the commissioning schedule.

9. Battery and Battery Charger

9.1 General

This specification covers the design, manufacture, delivery, installation and field test of the maintenance free battery and suitable battery charger for 110V DC system complete with all necessities for efficient and trouble-free operation as specified herein under.

Manufacturer of battery and battery charger shall be holder of valid ISO 9001 Certificate

(Including Design).

The Battery charger shall also include D.C. distribution board.

9.2 Equipment to be furnished

110 V Battery and Battery Charger

9.2.1 The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

9.3 Design Requirements

9.3.1 Battery & battery charger

9.3.1.1 Maintenance free Battery

(a) The Maintenance free Battery shall be rated for supplying total DC load of each substation. The duration of the load shall be ninety (90) minutes. The total DC load cycle shall consist of the following:

0-1 min. - Simultaneous tripping of all breakers on under voltage. In case the circuit breakers charge after tripping, starting current of the spring charged motor of all the above circuit breakers shall be considered for the entire 0-1 minute period.

- Emergency lighting load
- Control, indication, protection and annunciation load 1-89 minutes
- Emergency lighting load
- Control, indication, protection and annunciation load.
- Last minute lighting load.
- Control, indication, protection and annunciation load, emergency
- Closing of breaker - one at a time and spring charging if spring charging occurs after closing of breaker. Consider starting current of one spring charging motor and running current of another spring charging motor to occur simultaneously during the entire one minute a period.

The Contractor shall compute the Ampere hour rating (10 hour rating) of the battery considering margin over the above duty cycle so that the battery shall be capable of delivering the ultimate DC load of the substation when the future switchgear and its protection panel will be installed in the same substation. The minimum capacity shall be not less than 240 AH.

(b) The Contractor shall compute the Ampere-hour capacity at 10-hour discharge rate based on the above cycle and furnish the calculation. The minimum ambient temperature shall be 5 deg. C. The minimum voltage at the end of the load cycle shall not be less than 1.75 volts per cell.

(c) The batteries shall be storage type as specified.

- (d) The cells shall be maintenance free Lead acid type.
- (e) Each cell shall be in a suitable leak proof container with sealed cover.
- (f) The batteries shall be furnished complete with cell interconnectors and a suitable rack protected with acid resistant paint. The arrangement of the rack shall be such as to allow easy access and adequate space for normal maintenance in battery room.
- (g) Rated life of each battery shall be at least ten (10) years.
- (h) The Bidder shall furnish along with the Tender, his proposed layout of the battery racks to suit the space available.

9.3.1.2 Battery charger

- (a) The battery charger shall be suitable for maintenance free batteries and solid-state electronic type using silicon rectifiers and complete with all switches, fuses, contactors and instruments.
- (b) The battery charger shall be suitable for 400 volts +10%, 3-phase, 50Hz supply. The charger shall have fully automatic voltage regulation and electronic current limiting. The voltage regulation shall be within +1% for a 0-100% load variation and +10% voltage variation on the AC side. Cooling shall be by means of natural convection.
- (c) The minimum rating of the battery charger shall be not less than 75 amperes.
- (d) The battery charger shall be housed in a freestanding floor mounted cabinet with enclosure protection of IP-30 as per IEC.
- (e) The instruments, switches and lamps shall be flush or semi flush mounted on the front panel.
- (f) The battery charger shall be constant voltage type with provision of voltage variation from float charging to boost charging voltage. The float charging voltage shall be between 2.1 to 2.2 volts per cell or at any other voltage recommended by the battery manufacturer. At float charging voltage the charger shall furnish the continuous DC load consisting of control, indication, annunciation, breaker spring charging mechanism and continuously "On" emergency light as well as float charge its associated battery. The boost charging voltage shall be about 2.4 to 2.5 volts/cell or at any other voltage recommended by the battery manufacturer. During equalizing or boost charging, the continuous DC load shall be fed by the charger. The loads that can not tolerate the high equalizing or boost charging voltage shall be connected through dropper diode. The battery charger shall recharge the completely discharged battery to fully capacity in 9 hours. The charger shall have 10% excess capacity.
- (g) The manufacturer of above said battery charger shall be holder of valid ISO 9001 certificate.

9.3.2 Wiring

The wiring shall be complete in all respects so as to ensure proper functioning of control, protection and metering scheme.

All wiring shall be completed up to terminal blocks.

Wiring shall be done with 2.5 sq.mm. (minimum) Class 5 stranded copper conductor, flexible PVC insulated wire. The wire shall have a voltage grade of 600V as per IEC. Lower cross section of wires may be used for solid-state devices only.

Each wire shall be identified at both ends with wire designations in accordance with the approved wiring diagram. Interlocking type ferrules shall be used for identification.

Not more than two wires shall be connected to any terminal at each end. If necessary, a number of terminals shall be jumpered together to provide wiring points.

Wires shall be neatly bunched and adequately supported so as to prevent sagging strain on termination. Wires shall not be spliced or tapped between terminal points.

All spare contacts of relays and contactors shall be wired up to the terminal block.

9.3.3 Cable termination

The equipment shall be designed to facilitate cable entry from bottom. Removable plates shall be furnished with compression type cable glands to make entry dust tight and no weight is transferred on the terminal. The glands shall be suitable for terminating cable armor. Compression type cable lugs as required shall be furnished for termination of power and control cables.

Sufficient space shall be provided to avoid sharp bending and for easy connection. A minimum space of 200 mm from the gland plate to the nearest terminal block shall be provided.

9.3.4 Terminal blocks

Terminal blocks shall be specified in Technical Requirements under Sub-Clause 2.4 of Section VA.

9.3.5 Ground bus

A copper ground bus of 25 mm x 6 mm cross section shall be furnished along the entire length of each panel.

All devices shall be grounded to the ground bus.

9.4 Accessories

9.4.1 The following accessories shall be furnished for the batteries:

- (a) One (1) connector bolt wrench
 - (b) One (1) cell testing voltmeter with leads.
- Battery racks
Other necessary accessories

9.4.2 The charger shall be complete with the standard accessories including but not limited to the following:

- (a) Solid state surge protectors on the AC and DC sides
- (b) AC failure alarm relay
- (c) DC time delay low voltage relay
- (d) Ground detection alarm for positive and negative leads
- (e) Manual voltage adjust switch
- (f) DC ammeter and voltmeter

9.5 Tests

9.5.1 Type and routine tests at manufacturer's works and acceptance test at site shall be carried out on battery as per stipulation of latest standard of IEC.

The test shall include following tests:

- (a) General inspection.
- (b) Leakage test and internal short test for each cell.
- (c) One cell shall be type tested for discharge at ten-hour rate to 1.85V DC at 25 deg. C.

After initial charging the following tests shall be performed at site:

- (a) Capacity test
- (b) Efficiency test

9.5.2 The battery charger shall be subjected to the following tests at manufacturer's works:

- (a) Measurement on insulation resistance
- (b) High voltage test
- (c) Performance test
- (d) Temperature rise test

9.5.3 Test certificates shall be submitted to the Employer/Employer's Representative for approval.

9.6 Drawings, Data and Manuals

9.6.1 The following drawings and detail shall be furnished with the Tender:

- (a) Layout arrangement of battery and battery charger in the available space shown in the drawing.
- (b) Schematic and wiring diagram of battery charger
- (c) Cell voltage characteristic for battery
- (d) Technical leaflets on battery and battery charger

9.6.2 The following drawings and manuals shall be submitted by the successful Bidder for approval

- (a) Dimensional layout arrangement of battery and battery charger
- (b) Dimensional outline drawing of battery charger panel clearly showing the location of meters, switches etc.
- (c) Wiring diagram of the battery charger panel

- (d) Instruction manuals of battery and battery charger

9.7 Performance Guarantee

The performance figures quoted in Schedule of Technical Data shall be guaranteed within the tolerance permitted by relevant standard. In case of failure of the equipment to meet the guarantee, the Employer reserves the right to reject the equipment. The Contractor shall have to rectify the defect as no extra cost to the Employer and without delaying the commissioning schedule.

10. GROUNDING SYSTEM AND LIGHTNING PROTECTION

10.1 General

This specification covers the design, supply, delivery, installation and testing of the complete Grounding System as described herein.

10.2 Codes and Standards

The complete station grounding work shall be in accordance with the recommendation in the “Guide for Safety in Substation Grounding” IEEE No. 80 and the requirements of this section.

10.3 Equipment to be furnished

Complete installation of the ground grid, test link chamber, grounding of all equipment located in the substation as specified herein but not be limited to the supply of grounding conductors, jointing materials and all accessories to complete this grounding installation shall be covered under this specification.

10.4 Grounding Installation Features

10.4.1 The installation shall be complete in all respects for efficient and trouble free service. All work shall be carried out in a first class neat workmanlike manner. Grounding conductors shall be handled carefully to avoid kinking and cutting of the conductors during laying and installation. All exposed ground conductor runs shall be taken in a neat manner, horizontal, vertical and parallel to building walls or columns and shall not be laid haphazardly. All connections to the grounding grid shall be made with the bare copper stranded cable.

10.4.2 For all connections made to equipment or to the structures, the grounding conductor, connectors and equipment enclosures shall have good clean contact surfaces. Grounding conductor connection to all electrical equipment, switchgear, transformers, motors, panels, conduit systems, equipment enclosures, cable trays, distribution boards, equipment frames, bases, steel structure, etc., shall be by pressure type or bolting type connectors.

10.4.3 All lap, cross and tee connections between two grounding conductors both below and above grade shall be made by thermo welding process or compression type connector. The

various joints shall have adequate mechanical strength as well as necessary electrical conductivity not less than that of the parent conductors of the joints. All accessories for grounding installation shall be of quality and design approved by the Employer/Employer's Representative.

10.4.4 Grounding conductors, when crossing underground trenches, directly laid underground pipe and equipment foundation, if any, shall be at least 500 mm below the bottom elevation of such trenches/pipes.

10.5 Grounding Conductor

10.5.1 Main ground grid

The main ground system shall consist of a grounding grid buried minimum one meter below grade level. The grounding grid shall consist of one no. 100 sq. mm (min) stranded bare copper conductor cable.

10.5.2 Ground electrodes

The ground electrodes shall be 16 mm diameter and 1.5-meter long (min.) copper clad steel. These shall be driven into ground and connected to the main ground grid.

10.5.3 Risers

The risers shall consist of stranded bare copper conductor or connected at one end to the main ground mat and at the other end to the equipment.

10.6 Design Requirement

10.6.1 The Contractor shall measure the soil resistivity and calculate the total length of buried ground conductor, number of grounding electrode and their depth and spacing to achieve a grounding system resistance of not more than 1.0 ohm.

10.6.2 The Contractor shall calculate the cross-section considering the maximum fault level.

10.7 Tests

On completion of the installation, either wholly or in sections, it shall be tested in compliance with relevant code by the Contractor in the presence of the Employer/Employer's Representative. The cost of any test including labor, material and equipment charges shall be borne by the contractor. The ground grid resistance to remote earth shall be 1.0 ohm or less. If this low resistance cannot be obtained as per his design, then additional grounding conductors shall be buried in the earth, or if necessary, buried in treated soil to obtain the required low ground resistance.

10.8 Lightning Protection

The outdoor equipment of the substation and the substation building shall be protected against lightning. The lightning protection shall be achieved by one or more lightning masts or horizontal

lightning conductors above the protected equipment. The design of

the lightning protection system shall be subject to the approval of the Employer/Employer's Representative.

10.9 Drawings

After award of the Contract, the Contractor shall furnish the grounding layout drawing with dimensions showing the location of grounding grids, electrodes, test link chambers and risers backed up by necessary calculations for Employer/Employer's Representative approval. The work shall have to be started at site only after getting approval from the Engineer. If alternation is required for any work done before getting Employer/Employer's Representative approval, the same shall have to be done by the Contractor at no extra cost to the Employer.

11. LOW VOLTAGE DISTRIBUTION BOARD

11.1 General

This specification covers the design, manufacture, assembly, testing at manufacturer's works, supply and delivery, properly packed of low voltage distribution boards.

11.2 Standards

The equipment covered by this specification shall unless otherwise stated be designed, constructed and tested in accordance with the applicable section of the latest relevant IEC Specification. The equipment conforming to any other national standard, which ensures equivalent quality, is acceptable. In such cases the Bidder shall clearly indicate the standard adopted and furnish a copy of the English version of the standard along with the proposal. Should there be any dispute on design standard; the most stringent one shall be followed.

11.3 Equipment to be furnished

11.3.1 The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

11.3.2 Each distribution board must have sufficient number of spare feeder (at least 20% of various sizes used in the Distribution Boards with a minimum 1 no. on each bus). The incoming molded case circuit breakers and bus bar ratings shall be selected considering the spares also.

11.3.3 The distribution boards shall be complete with all accessories and materials.

11.3.4 The base channel frames for the distribution boards for grouting in the floor complete with anchor bolts, nuts and leveling attachments.

11.3.5 Special tools and tackles for erection and maintenance of the distribution boards and other equipment.

11.3.6 The Contractor shall furnish as many distribution boards as required to cater to his requirements, without any additional cost. If Tender's requirement, the same shall be supplied without any extra cost to the Employer.

11.4 Design Requirements

11.4.1 The AC distribution board is meant for miscellaneous loads such as but not be limited to battery charger, illumination, ventilation and air conditioning, space heater, station auxiliaries, etc.

11.4.2 The DC distribution board is meant for distribution of DC power to switchgear, control, relay and metering panel, emergency lighting fire protection system etc.

11.4.3 The distribution boards will be located indoor in a hot and humid atmosphere. All equipment, accessories and wiring shall be provided with suitable finish for prevention of fungus growth.

11.4.4 The AC distribution board shall be designed for operation in a 400V + 10%. 3 phase, 4-wire, 50 Hz + 5% neutral ground system. The DC distribution board shall be designed for 110V DC, 2-wire system.

11.4.5 The de rating of the equipment shall be done taking 45 deg. C as an ambient temperature of the site, if it is designed for lower ambient temperature. Furthermore, design and selection of all equipment shall be made liberally with a good margin of safety factors.

11.5 Construction Features

11.5.1 General

The distribution boards shall be self-standing sheet steel cubicle or wall mounted panel having following features:

- (a) The construction shall be compartmentalized.
- (b) All distribution boards shall be dead front type. All switches, circuit breakers, etc. shall be operable from the front.
- (c) All bolts and nuts exposed to external atmosphere shall be cadmium plated or zinc passivated.
- (d) The working height shall be limited to a maximum of 2,000 mm. The design shall be such as to permit easy extension of distribution boards at site on either end.
- (e) The distribution boards shall consist of vertical sections, fabricated from a minimum of 2mm thick sheet steel, shaped and reinforced to form a rigid freestanding structure.
- (f) The minimum clearance of the power terminal lug from the bottom plate shall be maintained as 200 mm.

- (g) The AC distribution board designed for 4-wire system shall have a fully insulated neutral bus of cross-section same as the main phase buses.
- (h) Anchor bolts and nuts for each distribution board shall be supplied along with the distribution board.
- (i) All distribution boards mounted indoor shall be provided with enclosure protection of IP50 as per IEC.

11.5.2 Bus bars

Bus bars shall be copper, liberally sized for the specified current ratings (both short circuit and continuous currents). Maximum temperature of the bus and bus connection shall be limited to 90 deg. C.

All bus bars, links, etc., shall be covered to prevent accidental contacts.

Buses shall be spaced with adequate clearance between phases and between phase and ground.

Bus supports shall be of molded insulators suitable for polluted atmosphere.

All bus works shall be braced to withstand stresses due to short circuit current, corresponding to the respective fault level of the system to which it is connected. The bus bars shall be able to withstand for 1 second the above short circuit current thermally.

Appropriate color code shall be used to identify the various phases of bus bars and the neutral (wherever applicable).

11.6 Specific Requirement

11.6.1 Molded Case Circuit Breakers (MCCB)

The molded case circuit breakers shall be of panel mounting type. It shall have all the live parts enclosed in a molded case and all contacts shall be silver-plated. The breakers shall be trip free and with quick-make and break operating mechanism. The molded case circuit breakers shall be provided with magnetic short circuit protection and thermal overload device. The characteristic curve of these protections shall be furnished along with the offer. The protection device of the incomer MCCB shall be coordinated with feeder MCCB. Each breaker shall have a common trip, causing on overload on one pole to trip all other poles.

The MCCB handle, after breaker tripped due to a fault shall occupy a mean position. The breaker shall be capable of interrupting a RMS current corresponding to the fault level of the system to which the respective distribution board is connected.

It shall be possible to close and trip the breaker without opening the compartment door. The breaker shall be provided with mechanical On-Off indicator at the front properly marked. Each circuit breaker shall be provided with alarm switch and auxiliary switch. The rating of the MCCB's shall

be so selected that maximum standardization consistent with the economy is possible. The incoming and bus section breakers shall have shunt trip coils.

11.6.2 Cable termination

Distribution board shall be designed to facilitate cable entry from bottom. Removable plates shall be furnished with compression type cable glands to make entry dust tight and no weight is transferred on the terminal. The glands shall be suitable for terminating cable armor. Compression type cable lugs as required shall be furnished for termination of power and control cables.

Sufficient space shall be provided to avoid sharp bending and for easy connection. A minimum space of 200mm from the gland plate to the nearest terminal block shall be provided.

11.6.3 Ground bus

Grounding terminals on the distribution board shall be provided at either end for connection of copper ground conductor to ground grid.

11.6.4 Nameplate

Nameplates showing “Feeder Designation” shall be provided for each module of distribution board at front door top. Also nameplate shall be furnished at the top for each distribution board.

Material for nameplate shall be a plastic sheet, 3mm thick or approved equivalent. The letters shall be white on black background.

The nameplate shall be held by self-tapping screws. The size of the nameplates shall be proportionate to the size of the modules. Also individual panel number and danger plate shall be furnished at the back of the panel.

11.7 Tests

11.7.1 Routine and type test

Type test certificates and results shall be as per relevant IEC. Specification for all the equipment offered under the scope of this specification shall be furnished.

Each distribution board shall be completely assembled, wired adjusted and tested for operation under simulated conditions to ensure correctness of wiring and proper functioning of all equipment.

All component parts such as MCCB’S, meters, etc., shall be tested in accordance with relevant IEC Specification.

All current carrying parts and wiring shall be subjected to a high potential test. All routine tests shall be conducted on all distribution boards.

11.8 Drawings, Data & Manuals

The following drawings and details shall be furnished along with the Tender.

- (a) Bidder’s proposed distribution scheme in single line diagram for all distribution boards.

(b) Bidder's proposed typical general arrangement drawing showing constructional features and layout of individual equipment along with the following:

- Space required in the front as well as back of distribution board.
- Power cable entry points
- Bus bar clearance, phase to phase and phase to neutral
- General cross-section drawing of the cubicle

(c) Technical leaflets on: MCCB, Terminal Boards, Insulators.

11.8.2 After award of contract the successful Bidder shall submit the following drawings for approval of the Employer/Employer's Representative.

(a) Confirmed outline dimensional drawing of all distribution boards, showing the general arrangement and indicating the following:

- Space required in the front and back
- Power cable entry points
- Bus bar clearance phase to phase to neutral
- Configuration of bus bars
- Technical details of supporting insulator and their spacing
- Outgoing power termination arrangement
- Transport/shipping dimensions with weights
- Foundation and anchor bolt details including dead load and impact load

Any other relevant drawing and data necessary for approval shall also be submitted by the bidder.

12. STEEL STRUCTURE

12.1 General

This specification covers the design, manufacture, testing, delivery and installation of steel structures to be used for supporting electrical equipment and gantry structure.

12.2 Codes & Standards

The steel structure shall be designed, manufactured and tested in accordance with ASTM or equivalent.

12.3 Scope of Works

The works includes, but is not necessarily limited, the following: (a)

Calculate and design as per requirements of this specification

- (b) Prepare complete detailed shop drawings and submit for approval of the Employer/Employer's Representative.
- (c) Prepare bill of materials and complete dispatch list.
- (d) Furnish all materials, labor, tools, plant, consumable, etc., including bolts, nuts, washers for fabrication in shop and on site and for erection.
- (e) Fabricate and deliver to job site, unload, store and erect structural steel for towers and all equipment frames.
- (f) Assemble bolt on ground at job site fabricated members for erection.
- (g) Erect fabricated materials and connect by field bolting.
- (h) Align and level erected structural steel.

12.4 Technical Requirements

12.4.1 The steel structures for extension of existing substations shall be so designed and fabricated that the connecting and joining works can be done with ease and exactness.

12.4.2 Design load of conductors shall be as follow:

Description	Tension of conductor per phase
- Incoming line	1,000 kg
- Internal bus	500 kg
- Overhead ground wire	300 kg

12.4.3 Steel structure dimensions, framing, member size and length, number, size and length of bolts, thickness of each filler and other necessary details to fabricate each piece shall be shown on the approved detail drawings. No change shall be made without the written approval of the Employer/Employer's Representative.

12.4.4 Bolts shall have hexagonal heads and hexagonal nuts with the same dimension between flats on bolt heads and nuts. Bolt holes are not to be more than 1.5mm larger in diameter than the corresponding bolt diameter. The design is to be such as to keep the number of different parts as small as possible and is to facilitate transport, erection and inspection.

12.4.5 No welding will be permitted in steel structure fabrication

12.4.6 Bill of material shall give the size, length and galvanized weight of each member and the total weights of steel structures. It shall also include the number of bolts, nuts and washers per structure.

12.4.7 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, and etc. must be true to detail drawings and free of burrs.

12.4.8 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.

12.4.9 After fabrication has been completed and accepted, all materials shall be clear of rust, loose scale, dirt, oil, grease and other foreign substances.

12.4.10 All materials including nuts and bolts shall be hot dip galvanized. The process of galvanization shall be as per latest version of IEC or ISI. The thickness of zinc coating shall not be less than 85 microns (610 gm/sq. m).

12.4.11 The material shall not be hammered or otherwise straightened in a manner that will injure the protective coating. If the material has been harmfully bent or warped in the process of fabrication or galvanizing, such defects shall be cause for rejection.

12.4.12 One of each type of structure shall be assembled in the shop to such extent as to insure proper field erection. Reaming of untrue holes will not be permitted. Shop-assembled parts shall be dismantled for shipment.

12.4.13 The structures shall include all necessary access ladders to give access to the various levels of the structures.

12.4.14 In addition to dead Dynamic loads imposed by equipment, steel work shall be designed to withstand simultaneously wind loads as follows:

- (a) On flat surface: 121kg/sq mm
- (b) For lattice structures: 121kg/sq mm on 1.71 times the times the projected area of the members of one face of the structure.

12.4.15 All structures shall be designed so that no failure or permanent distortion shall occur when tested with applied forces equal to 2.5 times to maximum simultaneous working loadings.

12.4.16 At or near ground level, all uprights shall be provided with holding down bolts provided under this contract.

12.4.17 Details and fastenings shall be designed to have factor of safety against failure not less than the main members of the structure.

12.4.18 Pockets and depressions likely to hold water shall be avoided and all parts of the structures shall be properly drained.

12.4.19 Bolts and nuts shall be galvanized and fitted with spring washers. Taper washers are to be added where necessary. Threads of bolts shall be spun galvanized and threads of nuts shall be oiled.

12.4.20 All member shall be cut to jig and holes shall be drilled or punched to jig.

Parts shall be carefully cut and holes accurately located so that the members are in position the holes can be accurately aligned before being bolted up., Drifting of holes will not be permitted.

12.5 Tests

12.5.1 All tests shall be carried out by the Contractor using his own instruments, testing equipment as well as qualified testing personnel.

12.5.2 The following shop test shall be performed with relevant provision of ASTM or equivalent.

- (a) General inspection
- (b) Material test (c) Assembly test
- (d) Galvanizing test

12.5.3 The results of all tests shall conform to the specified requirements as well as agreed guarantee figures finalizes with the Contractor.

12.5.4 Employer/Employer's Representative shall have the right to inspect any material, workmanship etc. of the equipment and may reject any item defective or unsuitable for the use and purpose intended, or not in accordance with the intent of the Employer/Employer's Representative.

12.6 Drawings

12.6.1 The Contractor shall submit the calculation sheet, design & shop drawing and guaranteed performance data.

12.6.2 The shop detail drawings shall show the details of all parts to be fabricated.

12.6.3 Erection drawings shall include bills of materials for each type of structure with the piece mark, size, length and calculated weight of each member.

12.7 Packing, Marking and Shipping

12.7.1 Methods of packing, marking, shipping, and storing shall be submitted to the Employer/Employer's Representative for review and acceptance.

12.7.2 Members of steel structure shall not be dropped or dragged on the ground and shall not be set on the ground for an extended period of time.

All steel shall be maintained clean and free of foreign matter and at no time shall it be set on wet

or muddy ground.

12.7.3 Boxes of bolts, nuts and similar connectors, and hardware assemblies shall be stacked off the ground and shall be covered with plastic sheets for protection from elements.

12.7.4 Materials, which are defective or damaged, when delivered, shall be repaired or replaced and shortages shall be made good immediately by the Contractor.

13. MISCELLANEOUS MATERIALS

13.1 General

This specification covers the design, fabrication, properly packed for transportation, deliver, installation, testing and putting into efficient and trouble-free operation of the bus material and insulator complete with all accessories.

13.2 Equipment to be furnished

13.2.1 The equipment to be furnished shall strictly be in accordance with the specifications and the Price Schedule.

13.3 Technical Requirements

13.3.1 Insulators

(a) General

All types of insulators shall satisfactorily withstand the specified climatic and service conditions. The strength of insulators as given by the electro-mechanical tests load shall be such that the factor of safety when supporting their maximum working loads shall be not less than two and a half.

Design shall be such that stresses due to expansion and contraction in any part of the insulators and fittings do not lead to development of defects.

All insulators, whether, cylindrical, post or string, shall have plain shed profiles. Damaged insulators shall be replaced.

Arcing horns are not required on post type and string insulators within substations.

(b) Materials

Porcelain insulators shall be in accordance with IEC where applicable. Porcelain shall be sound, free from defect and thoroughly verified and the glaze shall not be depended upon for insulation.

Porcelain glaze shall be smooth, hard, of a uniform shade of brown and shall completely cover all exposed parts of the insulators. Outdoor insulator fittings shall remain unaffected by atmospheric conditions producing weathering, acids, alkalis, dust and rapid changes in temperature that may be experienced under working conditions.

Suspension and tension insulators shall comprise porcelain units with ball and socket fittings.

Retaining pins or locking devices for insulating units shall be of phosphor bronze or other approved material, and shall effectively prevent accidental separation of the units.

Unless otherwise approved, the individual units of both the suspension and tension insulator sets shall be identical and interchangeable.

(c) Number of discs

String insulators shall comprise of 3 nos. of 11kV disc insulator.

(d) Marking

Each insulator shall have marked on it the manufacturer's name or trade mark, the year of manufacture and the manufacturer's reference mark. Tension and suspension insulators shall also be marked with the guaranteed electromechanical strength. Marks shall be legible and indelible.

(e) Post insulator

Post insulator shall be cylindrical type, solid core porcelain, provided in accordance with following requirements:

-	Rated voltage	36 kV
-	Nominal voltage	33 kV
-	Impulse withstand voltage	170 kV
-	Color	Brown

Test shall be divided into three groups in accordance with IEC 168.

(f) Standard particulars of insulator units

Insulator units shall comply with the following requirements. (IEC 305)

-	Porcelain disc diameter	254mm
-	Unit spacing	146mm
-	Creepage distance	292mm
-	Electro mechanical failing load	6,800kg
-	Dry power frequency withstand voltage	70kV
-	Wet power frequency withstand voltage	40kV
-	Dry impulse withstand voltage	110kV
-	Puncture voltage	110kV

Dimension and tolerances of ball and socket coupling shall comply with IEC Publications 120 (1977), and the internal height of the socket shall also comply with the requirements of IEC

Publication 372-1.

13.3.2 Bus Conductor and fittings

(a) General

Bus bars and electrical connections in outdoor substations shall be in accordance with BS, ASTM or equivalent national standards in respect of current rating and material analysis.

Bus conductor to be supplied shall be aluminum tube and aluminum conductor steel reinforced. Minimum size and material of each bus shall be as following

Bus	Material	Min. Size
- 33kV Main	Al Tube	As per actual
- 33kV Branch	Al Tube	As per actual
Overhead ground wire	GSW	55 sq. mm.

In case of existing substation conductors and connectors to be used for extension shall be as nearly as possible identical with the existing equipment.

Materials used for bus bars and connections shall be stressed to not more than two-fifths of their elastic limit. Provision shall be made for expansion and contraction with variation in conductor temperature and bus bars shall be arranged so that they may be readily extended in length with a minimum of disturbance to existing equipment.

Bus bars shall be in continuous lengths between supports. Connectors shall be of approved type, and if necessary type tested. Connection dependent upon site welding techniques will not be permitted.

Unless otherwise approved, bus bars and connections shall be so arranged and supported that under no circumstances, including short circuit conditions, can the clearances between live metal and earth of earthed metal work or between other conductors be less than the specified in the drawings. The extension of bus bar in the existing substation shall match with the existing one.

(b) Strain bus and fittings

The conductor shall be aluminum conductor steel reinforce (ACSR)

The conductor shall be constructed of hard-drawn aluminum and zinc-coated steel-wires which have the mechanical and electrical properties in accordance with the latest revisions of ASTM.

The direction of lay of the outer layer shall be right-hand. The direction of lay shall be reversed in successive layers: contiguous layers shall in all cases have opposite lay.

The external form and surface of the finished conductor shall be uniformly cylindrical upon completion of manufacture and shall remain so when erected in place on the line.

The surface of the conductor shall be free from points, sharp edges, abrasions or other departures from smoothness or uniformity that would tend to increase radio interference and corona loss. When the conductor is subjected to tensions up to 50 percent of its rated ultimate strength, the conductor surface shall not depart from its general cylindrical form, nor shall any of the strands move relative to each other in such a way as to get squeezed out of place and disturb the longitudinal smoothness of the conductor. Strands of a section of "popped" cable shall not protrude more than 1/2 of their diameter of a strand. The conductor shall be capable of withstanding the normal handling necessary for manufacture and erection, such as, reeling, unreeling, and pulling through stringing sheaves under sufficient tension to keep the conductor off the ground, etc., without being deformed from a cylindrical form in such a way as to increase radio interference and corona loss.

The make-up and lay of wires shall be such as to produce a conductor essentially free from a tendency to untwist or spring apart when cut. The steel wires shall be performed or post formed so that, when the conductor is cut and the aluminum wires are stripped away from the core as required for splicing, the steel wires can be readily regrouped and easily held in place with one hand to allow a splicing sleeve to be slipped over the steel core wire at the cut end of the conductor.

This forming of the core is required and shall be done in a manner which will not in any way scratch, scrape, remove or otherwise damage the zinc coating of the steel core wires, individually or collectively.

The conductor shall be free from excessive amounts of die grease, metal particles and dirt. The Bidder shall describe in complete detail the method which he proposes to use in normal production to clean the conductor. The effectiveness the cleaning process shall be subject to verification.

Where dissimilar metals are in contact, approved means shall be provided to prevent electro-chemical action and corrosion. Unless otherwise approved, joints and surfaces of copper or copper alloy fittings shall be tinned.

Suspension and tension conductor clamps shall be approved types and shall be as light as possible. Those for aluminum conductor shall preferably be compression type. Suspension and tension clamps shall be designed to avoid any possibility of deforming the stranded conductor and separating the individual strands.

Tension conductor clamps shall not permit slipping of or damage to, or failure of the complete conductor or any part thereof at a load less than 95 percent of the ultimate strength of the conductor.

Clamps and fittings made of steel or malleable iron shall be galvanized. All bolts and nuts shall be as specified and shall be locked in an approved manner.

(c) Tubular bus and fittings

Tubular bus shall be made of first melting aluminum alloy, cold rolled or hard drawn and assembled using corona free fittings. Continuous lengths of bare conductor shall be installed in bus to dampen aolian vibration.

The tubular bus conductor shall have adequate strength to withstand mechanical forces due to short circuit currents and its temperature when carrying full load current shall not exceed 75 deg. C. A safety factor of 2 for normal working loads and 15 with short circuit currents shall be used.

The tubular bus shall include a small drain hole in any low section. Where expansion joints are required they shall be of the thin leaf type. They are required at all potheads and as required on busbars. Bus supports for main tubular buses shall include on rigid fixed conductor clamp with slide fit on adjacent supports.

All bus support clamps shall be cast of first melting aluminum alloy. Each clamp shall be adjustable for alignment with insulator and furnished with four galvanized steel mounting bolts.

- Bolted type clamps shall be furnished with first melting alloy bolts, nuts and washers finished with anodic coating and lubricated. The clamps for tubing shall have dimensions and section suitable for splicing two pieces of tubing in the clamp.

- Flexible elements of expansion bus support clamps shall be laminated aluminum strap, which has current capacity equivalent to the tube.

Terminal connectors for aluminum shall be of first melting cast aluminum alloy. All terminal pads shall be furnished with stainless steel bolts, nuts and Belleville washers.

The bolted type terminal connectors shall be a multigrip type terminal and furnished with first melting aluminum alloy with bolts, nuts and washers finished with anodic coating and lubricated.

Bolted type connectors listed below shall be furnished with first melting aluminum alloy with bolts, nuts and washers finished with anodic coating and lubricated.

- Angle-Connectors: All angle-connectors shall be of streamlined, bolted type and made of first melting cast aluminum alloy. Tap element sockets shall be deep enough to allow for error in cut-off.

- Couplers: All couplers shall be bolted type and made of first melting cast aluminum alloy.

(d) Overhead ground wire

Overhead shield wire shall be galvanized steel wire, stranded with a cross-sectional area of 61.7sqmm and shall comply with BS 183.

Earth wires shall be greased as for conductors and the outer strands shall have a right hand lay.

Each completed shield wire shall be bare and shall be composed of the specified number of wires.

In case of existing substation, the tubular bus and its fittings to be used for extension shall be as nearly as possibly identical with the existing one.

The nominal diameter of individual wires shall have a variation of not more than plus or minus one and an-half (1.5) percent.

Joints or splices may be made in the individual wires prior to drawings to final size or in the finished wire composing the strand. Such joints shall have protection to corrosion equivalent to that of the finished wire itself and shall not decrease the strength of the finished strand below the specified minimum breaking strength. Joints in the individual wires in the finished strand shall be separated by at least 15.2 meters.

All wires in the cable shall lay naturally in their true position in the completed cable, shall tend to remain in position when the cable is cut at any point, and shall permit re- stranding by hand after being forcibly raveled at the end of the cable. The strand shall be free from imperfections and consistent with good commercial practice with a carefully controlled finish completely free from any dirt, loose metal particles, nicks, scratches, abrasions or deformities of any nature.

Each item of material to be furnished by the contractor shall be given the wire manufacturer's routing factory tests.

13.4 Tests

13.4.1 The insulators shall be tested in accordance with IEC or ANSI Standards. Certified copies of the tests shall be submitted for approval to the Employer/Employer's Representative.

(a) Type tests

- Low frequency wet withstand test
- Critical-impulse flashover test
- Impulse withstand test
- Radio-influence voltage test
- Compression strength test
- Thermal shock test

(b) Quality conformance tests

- Visual and dimensional test
- Porosity test
- Galvanizing test
- Cantilever strength test

- Torsional strength test
- Tensile strength test

(c) Routine tests

- Flashover test
- Tension proof test

13.4.2 Bus materials

The following shop tests shall be performed for bus materials. All tests shall be made at the manufacturer's plant by and at the expense of the Contractor. Certified results of test shall be submitted whether or not the inspection is waived. The Employer/Employer's Representative may, at its option, waive part or the whole test.

(a) Aluminum tube

- General inspection
- Chemical composition of aluminum alloy
- Conductivity measurement of aluminum tube
- Dimension and weight measurement
- Certified report of aluminum alloy from the original manufacturer

(b) Bus support clamp and connector

- General inspection
- Dimension measurement
- Chemical composition of aluminum alloy
- Certified report of aluminum alloy from the original manufacturer

(c) Connectors for stranded conductor

- General inspection
- Measurement of dimension
- Compression test
- Certified report of aluminum alloy from the original manufacturer

(d) Miscellaneous hardware

- General inspection
- Measurement of dimension
- Tension test
- Galvanizing test

13.5 Packing and Marking

13.5.1 Insulator

(a) Packaging

The insulators shall be packed in strong wooden boxes with a waterproof lining. These boxes shall provide adequate protection against salt spray, chemical attack and damage that might be encountered in transportation and rough handling during loading, transportation to job site, unloading to temporary storage and ocean transportation.

(b) Marking

In addition to marks required for shipping purposes, each crate and pallet shall be marked with Shipper's identity and Employer's name and address and quantity and type of contents. Also, the gross, tare and net weights in kilograms shall be stenciled on each pallet.

13.5.2 Bus materials

(a) Packing

The conductor shall be furnished on non-returnable wooden reels, and shall be properly protected to prevent displacement, chafing, distortion, damage from corrosive atmosphere or other damage to the conductor, which might be encountered in shipping, storage or handling. Each layer of conductor shall be separated from the adjacent layer in such a manner as to prevent abrasion or other damage during handling and shipping.

The non-returnable reels shall be made of a strong material suitably strengthened for ocean transport and treated to withstand rotting or any type damage due to ocean atmosphere. The reels shall be capable of withstanding all stress due to braking and string operations. The Employer will accept the use of returnable reels, but any additional costs of such reels will be the responsibility of the Contractor.

(b) Marking

In addition to marks required for shipping purposes, each reel head shall be stenciled to show serial number, type of conductor, length of conductor in meters, the gross, tare, and net weights in kilograms. Each reel shall also be plainly marked to indicate the direction in which it should be rolled to prevent loosening of the conductor on the reel. Those reels from which test samples were taken shall be marked "Tested" with the length of sample conductor removed.

13.6 Guarantee

Any defects in materials or workmanship or other failure to meet requirements of these specifications, which are disclosed prior to the Taking-Over by the Employer, be corrected entirely (including removal and replacement) at the expenses of the Contractor.

Any latent defects not disclosed before date of the Taking-Over but disclosed within guarantee period, materials and/or supplies shall have been placed in use, shall be corrected promptly by and at the expense of the Contractor.

13.7 Wall mounted Split-type Air-Conditioners

General

This specification covers the supply, delivery, field test and installation of Air- Conditioners at Substations.

Equipment to be furnished

Split-type Air-Conditioners (Inverter type) shall be furnished with all the accessories to complete the scope of works as given in the price schedule.

Scope of Works

Supply, delivery and installation of the Air-Conditioners shall include but not limited to that:

Civil works like breaking of wall and repairing wherever necessary.

Any support structures and leak proofing compounds required for proper sealing.

Bidder shall provide operation maintenance instruction translated in Nepali font in A4 size paper with good glass frame for each rating.

Design Requirements

- Cooling Capacity-18,000 BTU/hr (~1.5 Ton) for medium to larger rooms
- Compressor-Digital Inverter Compressor for energy saving and stable temperature
- Function-Hot & Cold operation for year-round comfort.
- Dehumidifier Function-Removes excess humidity for comfortable indoor air.
- Installation Pipe-Fitting pipe up to 5 m (extendable up to 15 m length and 7 m height)
- Accessories-Includes remote, connection cables, user manual, and installation tools
- Filter-Anti-Bacterial Easy Filter Plus with Auto Clean function
- Design-Sleek, wall-mounted split design with anti-corrosion outdoor fins
- Power Supply-230 V / 50 Hz

Or

Equivalent

Manufacturers

The AC shall be from the following manufacturers:

Mitsubishi

Daikin

Samsung

Or equivalent make / brand

Quality Certification: ISO 9001-2000 certified and CE certification.

Warranty: 12 months from the date of commissioning.

14. 12KV SWITCHGEAR

14.1 Scope of work:

14.1.1 All the works/material as specified in Bill of Quantity and the scope of work shall be the integral part of the job and all the cost reoccurred in this respect and shall be included in the bid price. So the bidder is requested to visit the site and contact the Owner in case of any items/ works not understood before the bid submitted.

14.1.2 12kV cubicle type Indoor Switchgear Panel shall be an air insulated metal clad switchgear with withdrawal vacuum circuit breaker with the fault interrupting capacity of at least 25 kA at 11kV solidly grounded system. The switchgear shall be arranged in single bus bar. The cubicle shall be of modular design provided with space heaters, with the following modules integrated neatly to form dead front type switchgear capable of extension on the both side, forming a single row, single bus bar switchgear panels.

Breaker Compartment. Bus bar
Compartment
Cable, C.T. and P.T. Compartment
Instrument and Relay Compartment (LV Compartment)

14.1.3 All Switchgear operation shall be performed behind a close door. Additionally, it shall even be possible to perform all preparations for work inside the cubicle with full degree of protection.

14.1.4 The use of insulation material shall be reduced to minimum, only ripped insulators with high-anti-tracking characteristics shall be used for necessary conductor supports.

14.1.5 Cubicle front shall be covered by a door with inspection windows for mechanical indication for CB ON/OFF position, spring charged and counter indication of CB operation.

14.1.6 The cubicle shall be of modular design consisting of separate modules for busbar, circuit breaker, cable and low voltage compartment, and instrument component. Each compartment shall have its own pressure relief flap. The fixed contact shall be mounted in bushing moved by circuit breaker carriage.

14.1.7 Earthing to cable feeder and busbar shall be done via earthing switch manually operated from panel front.

14.1.8 Fixed contacts shall have flat silver plating and contact pressure of male and female contacts during connected position according to the International Standard.

14.1.9 Bus bars and Jumpers shall have made of flat electrolytic bare copper contact with special heat shrinkable sleeves which provide effective insulation between phases or phase to earth, even if

bridged by vermin or other conducting body and suitable for rated current

not less than 2000 A. Bus bar shall be latched per panel and easy to replace by standard normal material. Flexible insulation shrouds shall cover the bus bar to Jumper Joints and jumper to stationary contact joints.

14.1.10 Bottom of the cubicle shall be covered with a bottom mica plate through which cables are passed into the panel through the appropriate cable glands.

14.1.11 The proposed switchgear panel shall be extendible.

14.1.12 The proposed switchgear panel shall be suitable for mounting of standard Current and Voltage Transformer according to IEC standard.

14.1.13 It is observed that most of the fault and damages inside the CB is due to the short circuit condition carrier out by crawling animals like rat , lizards etc. So, special attention shall be given during design and fabrication, for preventing them to enter into the chamber.

14.1.14 Panel shall be of enclosure protection of class IP54

14.2. WITHDRAWABLE PART (CARRIAGE)

14.2.1 The chassis shall be made of sheet-steel section and shall carry the switching device, moving mechanism, 4 rolling contact bearings for movement and interlocking mechanism. Movement for carriage shall be done manually and shall be independent from switch room floor.

14.2.2 Moving contacts shall be double flat contact with silver plated contact pieces. The flexible fixing shall allow high tolerance and avoiding overheating.

14.2.3 Connection of auxiliary supply to the fixed part shall be verified via multi-pole plug which shall be included in the interlocking system. For the easy and assured insert of the plug the hose should come from the fixed part and the plug shall be on the withdrawable part.

14.2.4 CB and Isolating Switch Carriage shall have the provision to operate mechanically behind the closed door in Operating and Test Position.

14.2.5 Carriage of the same rating shall be exchangeable. It shall be possible to insert CB with higher current in lower rated cubicle but not vice versa.

14.3 11 KV METALCLAD SWITHGEAR:

14.3.1 Main Equipment Characteristics

14.3.1.1 Insulation:

- i. 12kV primary equipment shall be insulated to meet or exceed the following criteria:

Rated Lightning Impulse Withstand Voltage (kVp): 75
Rated Power Frequency Withstand Voltage (kVrms): 28

ii. 12kV cubicles shall be designed to provide phase segregation within the enclosures.

14.3.1.2 Clearances:

i 12kV Primary Equipment clearances between phases and phase to earth shall not be less than as in BS162 or in this specification, whichever is greater.

ii The layout of the equipment shall provide for safe access for operation and maintenance whilst the remaining sections equipment are alive.

iii Minimum clearances in air for the 12kV 'Indoor' Primary Equipment shall not be less than:
Phase to Phase (mm): 127
Phase to Earth (mm): 76.2

iv The busbars shall be insulated by High Grade Phase Insulation. Busbars partitioning shall be done by means of a bushing plate with Cast-Resin Insulators and Cubicles shall be partitioning with earthed sheet metal barriers.

14.3.2.3 Current Carrying Capacity:

i Switchgear 12 kV Busbars and Connections thereto shall be designed to carry current corresponding to Maximum Permissible Overload of the connected equipment without exceeding temperature rise specified in the Relevant Standards.

ii Switchgear 12kV buswork shall be designed to safely withstand with an appropriate margin of the Mechanical and Thermal Effects corresponding to at least the following short circuit currents:

Symmetrical three-phase

(Is) (kA) rms: 25
Peak making Current (kA)p: 63

14.3.2 Circuit Breakers:

14.3.2.1 General

The 12 kV Circuit Breakers shall be Vacuum type, easily withdrawable and housed in a cubicle. It shall consist of three Vacuum Interrupter, three Supports and Operating Mechanism. The Operating Mechanism shall have Motor Charged Spring Operated with provision of hand operated mechanism. With the breaker in close state, spring energy shall be for a "Trip/Close/Trip" Cycle.

14.3.2.2 Main Data:

Type: Metal enclosed, Indoor switch type: Metal enclosed, Indoor switchgear cubicle type with vacuum interrupters.

Nominal Service Voltage (kV)	: 11
Rated Voltage (kV)	: 12
Rated Frequency (Hz)	: 50
Rated Nominal Current (A) :-	
Breaker for Bus Coupling	: 2000A
Feeder Breaker	: 800A
Incomer for Main Power Transformer	: 1250A
Rated Short-Time Breaking Current (asymmetrical) at Rated Voltage, kArms	: 25
Rated Short-Time Making Current at Rated Voltage (KA) _p	: 62.5
Rated Operating Mechanism	: Motor-spring operated.
Provision for Manual Operation	: Yes
Bus Bar Rating	2000 A.

14.3.2.3 Technical Requirements:

- i The Circuit Breakers shall meet requirements of BS 5311 and IEC 56.
- ii Vacuum Interrupter: The Arcing chamber with the two stem connected contacts shall be located between two ceramic insulators. One contact shall be fixed to the housing and the moving contact shall be connected to the housing via vacuum tight bellows. The metal bellows shall enable the moving contact to carry out its strokes. The metal bellows must be able to withstand the movement corresponding to 30,000 make / break operation without failing. The insulators shall be made of metallized aluminum oxide ceramic which permits them to be brazed to metal so that there is no need to use conventional seals. The Vacuum Interrupter shall remain vacuum tight throughout its working life.
- iii The Transformer CB shall be capable of interrupting the corresponding 11kV distribution lines in the event of failure of the respective feeder breakers.
- iv The Operating Mechanism shall have two Trip Coils and be electrically Trip-Free and Antipumping.
- v The Spring Charging Motor, the Closing Coil, the Tripping Coils and all other control devices of all circuit Breakers shall be suitable for 110V d.c Operation.
- vi A Manually Operated Mechanism for closing and tripping shall be provided in the breaker cubicle for Maintenance and Emergency Operation. This device shall be so interlocked

that while it is operative, the breaker cannot be operated remotely.

vii Each Circuit Breakers shall be equipped with an Operation Counter (to register tripping operations) and position indicator, on the cubicle front.

viii Provision shall be made for Remote alarm/indication of the following status through a pair of NC+NO contacts:

Circuit Breaker "Open". Circuit Breaker

"Closed". Circuit Breaker "Trip".

Circuit Breaker "Device Mechanism Faulty". Trip Circuit Healthy.

Circuit Breaker "Failure"

ix The circuit breaker shall be equipped with a local control switch and local remote selector switch auxiliary contacts for remote indication. All contacts shall be wired to terminal block in the breaker cubicle.

x Each of the circuit breakers shall be housed in a free standing indoor type cubicle. This cubicle (and others comprised in the 11kV metal clad switchgear) shall be of standard construction and shall be suitable for attachment of cable connection as described in relevant cubicles. These cubicles shall be equipped with copper earthing busbars of not less than 200Sq.mm.

xi Plugging contact apertures shall be fitted with fully automatic metal safety shutters to close the apertures and prevent access to live part when truck partition is withdrawn and to open when the truck partition is being plugged in. The shutters shall form reasonable dust, drip, fire and insect proof enclosures over the apertures. The respective sets of shutters shall be clearly, boldly and permanently marked 'Busbars' and 'Feeders' respectively.

xii Auxiliary Switches shall be provided as required for Indication, Control, Protection and Interlocking. In addition, a minimum of two Normally Open and two Normally Closed Auxiliary Contacts shall be provided as spare contacts. All available contacts of Auxiliary Switch Assembly shall be wired to the Terminal Blocks on the fixed portion of the equipment of the switches and terminals shall be such as to facilitate future extension.

xiii All auxiliary switches shall have contacts with strong wiping action. the switches shall be located in an accessible position and adequate physical protection shall be provided.

xiv The Circuit Breakers shall be tested in accordance with BS5311 and IEC56 and IEC60 and shall include the following routine tests:

Mechanical operating tests

Power Frequency Voltage withstand tests. Tests on auxiliary and control circuits

xv The quality assurance of the equipments and their auxiliary shall be based on ISO9001 Standard.

xvi The Minimum Operating Cycle (without maintenance) of Interrupters and Operating Mechanisms shall be suitable for operation over 10Years or 10,000 operations with rated current or 100 operations with rated short circuit current and overall life shall be more than 30,000 operating cycles.

xvii The Vacuum Circuit Breaker installed in the Switchgear shall move into following position in the Circuit Breaker Components:

* Running Position (Run)

Main Circuit and Control Circuit connected to all circuits.

* Test Position (Test)

Main circuit separated from the circuit and only Control Circuits are Connected.

* Disconnected Position

As a Control Circuit Connector that would be plugged by hand during the test position both Main and Control circuit are disconnected from the Circuit.

14.4. EARTHING SWITCHES

The Earthing Switch is operated by means of detachable lever from outside the cable compartment. It shall be mechanically interlocked with the CB so that the earthing switch in close position in section of CB truck into the service position is not possible. The operation of the Earthing Switch shall not be possible as long as the CB is not in isolated position.

14.4.1 The 11kV metalclad switchgear shall include earthing switches to facilitate earthing of each cubicle as specified.

14.4.2 Main Data

Rated Voltage kV	12
Rated Current A	1250
Short Circuit Current withstand capability (as specified above) Bus Bar Rating A = 2000	

14.4.3 Technical Requirements:

- i. The Earthing Switches shall meet the requirements of BS 5253 and IEC 129. ii. Auxiliary Switches shall be provided as specified for the Circuit Breakers.
- iii. Provision shall be made for padlocking in the Open and Closed position.
- iv. Manual control of the switches and position indicator external to the cubicle shall be provided.
- v. The Earthing Switch shall be interlocked manually with transformer circuit breakers.

14.5. INTERLOCKING

The following operation shall be taken place only when the under stated interlocking conditions are fulfilled to ensure Personal and Operational Safety.

14.5.1 Transferring the withdrawable part from the Disconnecting Position to the Service Position:

- * Control Circuit Plug Inserted
- * High Voltage Compartment Door closed.
- * Circuit Breaker in OPEN Position.
- * Earthing Switch in OPEN Position

14.5.2 Transferring the Withdrawable part from the Service Position to the Disconnected Position.

- * Circuit Breaker in OPEN Position.

14.5.3 Operating the Circuit breaker

Withdrawable part in the Interlocked Final Position (Service or Disconnecting position)

14.5.4 Operating the Earth Switch

- i. Withdrawable part in the interlocked disconnected position. windows shall be provided to allow visual inspection.

The Switches shall be tested in accordance with BS5253, IEC129 and IEC265 and shall include the following routine tests:

Operating and Mechanical tests Measurements of the resistance of the main circuit.

14.5.5 Safety Device

Individual explosion vents should be provided for breaker / busbar / cable chambers on the top of the panel to let out the gases under pressure generated during an unlikely event of fault.

Cubical with the front plate is pressure tested for the internal arc fault as per PHELA recommendations.

Circuit breaker and the sheet metal enclosures are fully earthed.

14.6. LOW VOLTAGE COMPARTMENT:

The Low Voltage Compartment of the Switchgear shall be located on the top front of the Panel and shall be accessible with a separate door and partitioned against high voltage part. Connection of control and Metering cable is by means of a multiple plug to the withdrawable part possibly at front face of the breaker. Low voltage devices metering and protection equipment shall be mounted flush in the door or on the mounting plate inside.

Wiring inside the cubicle shall be done by 2.5 Sq.mm insulated stranded copper wires for current circuits and 1.5 Sq.mm for voltage circuits.

The following equipments shall be mounted in the low voltage compartment.

- * 1 No. Ammeter, Digital Type of class C designation, with selector switch. (for incoming and outgoing circuit breaker)
- * 1 No Voltmeter, Digital type, with Voltage Selector switch (for incoming and outgoing circuit breaker)
- * 1 No kVA meter, Digital type of class designation (for incoming and outgoing circuit breaker)
- * 1 No Energy meter 3Phase 4 wire, 3Element, as specified (for incoming and outgoing circuit breakers)
- * 1 No Power Factor Meter Digital type 3Ph, 4Wire, 3Element. (for incoming and outgoing circuit breaker)
- * Nos Overcurrent Relay Static Type 5A secondary current with (for incoming and outgoing bus coupler circuit breaker)

- Setting range 5-250% in step of 1 for Overcurrent element
- have a time multiplier range of 0.025-1 in step of 0.001 for phase fault
- Setting range 50-3000% in step of 50% for High Set Element

- * 1 Earth fault Relay, Static Type, with Secondary Current 5A and with Instantaneous tripping setting range 5-250% (For incoming and outgoing circuit breaker).

- Setting range 5-250% in step of 1 for Earth fault element
- have a time multiplier range of 0.025-1 in step of 0.001 for earth fault
- Setting range 50-3000% in step of 50% for High Set Element

Auxiliary relay and coupling relay if required

Anti-condensation heater (for incoming and outgoing circuit breaker)

14.7 CURRENT TRANSFORMERS:

14.7.1. The 12kV Metalclad Switchgear shall include protection and metering Current Transformers as specified. The Current Transformers shall be Epoxy Resin insulated block type Current Transformers as follows:

Circuit		Ratio	Accuracy Class	Burden
For Incoming	Core 1 (for Protection)	1200/600/300/5	5P20	30VA
	Core 2 (for Metering)	1200/600//300/5	0.5	30VA
	Core 3 Differential		PS	30VA
For Bus coupler	Core 1 (for Protection)	1200/600/300/5	5P20	30VA
	Core 2 (for Metering)	1200/600/300/5	0.5	30VA
For Outgoing	Core 1 (for Protection)	800/400/200/5	5P20	30VA
	Core 2 (for Metering)	800/400//200/5	0.5	30VA

14.7.2 The current transformer shall comply with the requirements of BS 3938 and IEC 185 shall confirm to the specified insulation requirements and shall withstand without damage the applicable short-circuit current specified. Primary ratio taps shall not be accepted. The ratio given above is tentative one, the final decision shall be taken prior approval of the drawing.

14.7.3 The manufacturer of current transformer shall be the holder of valid ISO 9001 certificate.

14.7.4 Maximum temperature rise at rated primary current shall not exceed 50 degree centigrade.

14.7.5 Accuracy classes for the protection and metering shall not be less than 5P20 and 0.5 respectively. Burden and accuracy class shall be adequate to ensure correct operation of associated protective devices and instruments. Saturation curves shall be provided with C.T. Characteristics.

14.7.6 Each set of secondary windings shall be wired to suitable terminal blocks and earthed at the first control or relay panel to which they are connected. Differential Protection Circuits (involving more than one set. of CT's) shall be earthed at one location only.

14.7.7 The Current Transformers shall be tested in accordance with BS 3938 and IEC 185 and shall include the following Routine Tests :

- (i) Verification of terminal markings polarity etc.
- (ii) Power frequency tests on primary windings.
- (iii) Power frequency tests on secondary windings.
- (iv) Overvoltage inter-turn tests.
- (v) Determination of ratio error and phase displacement.

14.8. VOLTAGE TRANSFORMERS

14.8.1. The 11kV Metalclad Switchgear shall include Voltage Transformers in incomer as required by the Single Line Diagram as follows:

Type : **Epoxy-resin insulated, single pole with 7.3A Primary side fuses**

Basic Impulse Level: **75kV**

Primary Voltage: **11/ $\sqrt{3}$ kV**

Secondary Circuit: **110/ $\sqrt{3}$ V**

Rated burden: **100 VA**

Accuracy classification: **0.5 Class**

14.8.2. The voltage transformers shall comply with the requirements of BS 3941 and IEC 186. Accuracy class for the metering case shall be 0.5 Bidder shall insure whether 100VA is sufficient for the smooth operation.

14.8.3 The voltage transformers and their fuses shall meet the specified insulation requirements and have a rated primary voltage of 11kV with knee of saturation curve not lower than 12kV and ratios per single line diagram.

14.8.4 The voltage transformer shall be provided with high rupturing capacity (HRC) fuses for primary and secondary circuits. The fuses shall be rated for the short circuit levels specified.

14.8.5 The voltage transformers shall be tested in accordance with BS 3941 and IEC 186, and shall include the following routine tests: Verification of

terminal markings.

High voltage power frequency withstand test on primary windings. High voltage power frequency withstand test on secondary windings. Tests for accuracy.

14.8.6 The voltage transformer shall be installed at the suitable place in the incoming circuit breaker.

14.9 CONTROL PROTECTION AND INSTRUMENTATION:

14.9.1 This covers the detailed requirements 11kV switchgear panel cubicles, and design, manufacture, transport, installation and commissioning of new 12kV Metal clad VCB switchgear.

14.9.2 The substation will normally be attended and operation will be semi-automatic. Normally closing of circuit breakers shall be manual operation and operation of earthing switches will be manual if it is not mentioned.

14.9.3 Local control facilities adjacent to the equipment shall be provided for maintenance, inspection and emergency operation.

14.9.4 The control system shall be designed to permit the following operating modes:

14.9.4.1 Automatic start/stop operation refers to spring-charged motor for operating mechanism of 11kV VCB.

14.9.4.2 Automatic tripping of 11kV VCB, LV MCB if faults occur in protected lines equipments or circuits.

14.9.5 The control system shall be arranged in such way that it is possible to change between local automatic and local manual control any time.

14.9.6 Solid state modular equipment shall be used wherever possible.

14.9.7 The designs shall be in general conformity with the single line diagrams and layout drawings accompanying this specification.

14.9.8 Under manual control the individual operations shall each be subject to safety interlocks being satisfied.

14.9.9 The control scheme shall be operationally simple, safe, easy to maintain and functionally consistent.

Each module shall have sufficient test points to facilitate fault finding. Control circuits shall be brought out to isolating terminals to permit efficient trouble shooting.

14.9.11 Each cubicle shall be provided with a sufficient point annunciator to identify an alarm condition, including audible alarm, test, acknowledge and reset push buttons.

14.9.12 Control switches for circuit breakers shall be of the discrepancy type. Two independent movements shall be required to initiate an operation. The position of manually operated disconnecter shall be indicated by means of discrepancy indicators.

14.9.13 The design shall be such that as to avoid nuisance alarms and shall block those devices which assume alarm conditions when the equipment is under shutdown. Annunciator windows shall be engraved with identification of the alarm condition.

14.9.14.1 Annunciators shall have the following sequence:

Condition	Lamp	Alarm
Normal	Off	Off
Alarm Flashing	On	On
Acknowledge Reset after return Normal	On	Off
Lamp test	Off	Off
	On	Off

14.9.14.2 Required signals or alarm systems:

CB Off/On position by green/red lamp

Flag or lamp indication of faults for :

Overcurrent Protection, E/F Protection, DC Supply Failure, CB Failure, MCB tripped, AC supply failure, interlocking system disturbed, CB driving faults.

14.9.15 The annunciator shall be of solid state type and suitable for operation at 110 V dc and shall be able to withstand IEC 255 class 3 tests without malfunctioning.

14.9.16 Protection required:

- i. For incoming & outgoing -**O/C and E/F protection with instantaneous tripping**
- ii. For bus coupler panel - **O/C protection.**

14.9.17 Transformer Protection:

Following protection shall be provided for the step-down power transformers in incomer feeders:

14.9.17.1 Transformer Differential

Differential relay shall be provided for the protection of 33/11kV, 6/8 transformer.

14.9.17.2 Overcurrent (if applicable)

Backup protection shall be provided in the form of inverse time overcurrent relay connected into the transformer LV neutral connected current transformer.

14.10 FACTORY TESTS:

Factory tests shall include inspection and routine testing of all relays and devices as per BS and IEC publications. Continuity and insulation testing of all devices and wiring and complete control sequences testing shall be performed to the extent feasible in the plant.

All electronic equipment items and the subsystem shall be operated continuously for a minimum of two hundred (200) hrs. prior to shipment in accordance with the approved testing procedures to ensure the operational integrity of each component and of the total system.

Type test reports for each protective relay shall be provided.

Each component of protective equipment shall be tested at the Manufacturer's work or at site to establish its performance characteristics.

14.11 MINIMUM REQUIREMENT FOR SWITCHGEAR

14.11.1 All 11kV feeder and bus coupler cubicles shall house single circuit breaker per pond. Each circuit and feeder shall be equipped with the following devices and equipment Withdrawable module with:

• Hand operated drive mechanism	1 Set
• Auxiliary block with 4NO+ 4NC contacts for position indication	1 No
• Multiple pole lug for control signals	1 No.
• Motor operated spring charging mechanism	1 No.
• Close/trip buttons	1No.
• Trip coil	1No.
• Closing coil	1No.
• Counter indicating number of switching operation	1No.
• Auxiliary block with 11NO + 11NC 1Wi (alarm contact)	1No.
• Auxiliary switch for spring charged indication	1 No.
• Service track for removing of withdraw able module	1 No
• Breaker carriage (if applicable)	2No

Bus Coupler (if applicable)

• Copper busbars, rating shall be 2000A	1 Set
• Epoxy resin insulated block type current transformer as mentioned above in clause 13.7.	2 Nos.
1st Core : 0.5 class 30 VA (for measurement)	
2nd Core : 5P20 30 VA (for protection)	
• Breaker Carriage	1No.

14.11.2 Trunking (Adaptor) Chamber:

Trunking Chamber should have the voltage rating 12 kV and the current rating of bus bar shall not be not less than 2000A. Contractor must verify the overall dimension by inspection at the

site for accurate fitting. It is up to manufacturer / designer whether needed or not. If it is needed then its cost should be within the cost of required VCB. Its cost shall not be paid separately.

14.11.3 Specification of Meter to be installed

Please refer above in the Energy Meter

15. 33/0.4 KV STATION TRANSFORMER

15.1. Scope

These specifications cover the requirements of oil-immersed, naturally cooled three-phase station transformers suitable for outdoors installation on 33 kV, 50 Hz distribution systems.

15.2. Service Condition

The transformers shall be designed and constructed for outdoor installation and operation under the following conditions:

Ambient temperature:	-5°C to 45°C
Relative humidity:	up to 95%
Altitude:	up to 2000 m above the mean sea level

15.3. Standards and Quality Certification

15.3.1 The equipment specified in this Section of the Contract shall conform to the latest edition of the appropriate IEC specifications and/or other recognised international standards *equivalent to IEC Standards*. In particular:

IEC 60076	Power transformers
IEC 60137	Insulating Bushings for alternating voltages above 1 kV
IEC 60156	Insulating Liquids-Determination of the breakdown voltage at power frequency-test method
IEC 60296	Specification for uninhibited mineral insulating oils for transformers and switchgear
IEC 60551	Determination of transformer and reactor sound levels
IEC 60616	Terminal and tapping materials for power transformer
IEC 60722	Guide to lightning and switching impulse testing of power transformers and reactors
IEC 60733	Determination of water in insulating oils.
BS 5493	Protective coating of iron and steel structures against corrosion.

15.3.2 The manufacturer of the offered transformers must have been accredited with valid ISO 9000 quality certification with design in its scope of registration.

15.4. Description

15.4.1 Technical details are given in Table 1. The quantity of the transformers to be supplied shall be as given in the Price Schedule.

15.4.2 Tank

The tank shall be of welded construction and fabricated from mild steel of adequate thickness. All seams shall be properly welded to withstand requisite impact during short circuit without distortion. All welding shall be stress relieved. The tank cover shall be bolted on to the tank with weatherproof, hot-oil resistant, resilient gasket in between for complete oil tightness. Pressed-steel radiators shall be mounted on transformer-tanks. The radiator shall be of pressed-steel of corrugated type design. Heat dissipation calculation in respect of the number, size and length of the radiators are to be satisfied by design calculation. Each transformer shall be provided with a case of rigid construction, which shall be oil-tight and gas-tight. The thickness of all tank sides except the tank-bottom and cover shall not be less than 3.2 mm. The thickness of tank-bottom and cover shall not be less than

4.0 mm. The tank shall be capable of withstanding, without leakage or permanent deformation, a pressure 25% greater than the maximum operating pressure. The tank cover shall be bolted on to the main-tank. Each transformer shall be provided with earthing terminal with clamp type connector.

15.4.3 Painting

All sheet steel works shall be phosphated in accordance with the following procedure and in accordance with BS 2569 and BS 5493.

The tank body shall be sand/shot blasted to remove the welding scales. Oil, grease, dirt shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water, followed by final rinsing with dilute dichromate solution and even drying. The phosphate coating shall be sealed by the application of two coats of stoving type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved. After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. Touch up shall be applied after completion of tests. The color for the finishing paint shall be light gray or as approved by Employer. The final finished thickness of paint film on steel shall not be less than 60 microns. Finished painted surface shall present aesthetically pleasing appearance free from runs and drips. A small quantity of finishing paint shall be supplied for minor touching up required at site.

15.4.4 Core

The transformer shall be of core type. The cores shall be constructed with prime core- material of interleaved grade non-aging, low loss, high permeability, grain oriented and cold rolled silicon steel laminations, properly treated after being sheared to remove any burrs and shall be re-annealed to remove any residual stresses. The steel shall be thin in lamination.

The yoke laminations shall be in single piece instead of pieces to reduce chances of introducing more air gaps in the core construction.

All steel sections used for the support of the core shall be thoroughly sand blasted after cutting, drilling and welding.

All laminations shall be properly insulated with the materials that will not deteriorate due to pressure and hot oil.

The core shall be rigidly clamped with positive locking device to ensure adequate mechanical strength. Core and coil assembly shall be capable of withstanding the vibrations and shock during transportation, installation, service and adequate provision shall be made to prevent movement of core and coil assembly relative to the tank during these conditions. The core shall be provided with lifting lugs suitable for lifting complete core and coil assembly of transformer.

Permissible Flux Density and Over Fluxing

Flux density at rated voltage and frequency shall not exceed 1.6 T. The no-load current at rated voltage and at 112.5% voltage shall not exceed the values given below with tolerance as indicated.

At 100% rated voltage:	2% of rated full load current + 30% as tolerance.
At 112.5% rated voltage:	max 4% of rated full load current

The bidder shall submit the design calculation in support of flux density and no-load current at 100% and 112.5% voltage along with drawings of core-steps, limb-diameter, window-height, limb-center, etc.

15.4.5 Winding

The design, construction and treatment of winding shall give proper consideration to all service factors. The winding shall be so designed that all coil assemblies are of identical voltage ratio and shall be interchangeable. All delta leads should be clamped tightly on to the special frame/bracket making pie (π) frame. The leads leading to the bushing terminals should be clamped to the horizontal support base of the pie frame so that vibration during short circuit is not passed on to the windings. The completed assembly of core and coils shall be dried in a vacuum sufficient to ensure elimination of air and moisture within the insulating structure. After the drying process, the assembly shall be immediately impregnated with dry oil to develop full electrical strength in the windings. The windings of the transformer shall be fabricated from high conductivity E.C. Grade (A) copper materials.

Current Density

Current density for any part of the winding shall not exceed the following values: Copper

winding transformers	$\leq 2.8 \text{ amp/mm}^2$
Aluminum winding transformers	$\leq 1.5 \text{ amp/mm}^2$

15.4.6 Oil Preservation System

The transformers shall be oil filled type and provided with conservator. The conservator vessel shall have a capacity between highest and the lowest levels of not less than 7.5% of the total cold oil volume of the transformer. Each conservator vessel shall be fitted with a sufficient-size breather in which silica-gel shall be used as the drying agent. Windows in the silica-gel breathers shall be

sufficiently large enough to allow crystal color change to be easily observed from a distance of 6 m. The position of the silica gel breather shall be such that maintenance can be carried out without the need to de-energize the transformer.

15.4.7 Tap Changer

An externally - operated tap changer shall be furnished with the transformer. It would be operated only when the transformer is de-energized. The tap changer shall include an operating handle, visible indication of tap position and means for locking the tap changer in any desired position. The locking device shall be arranged to prevent locking the tap changer in an off position. Mechanical means shall be provided for limiting the maximum and minimum travelling of the extreme tap positions to be at the maximum and minimum position of the tap changer.

15.4.8 Insulating Oil

All transformers shall be filled to the required level with a new, unused, clean, standard mineral oil in compliance with IEC 60296.

15.4.9 Bushings

The bushings shall be made of homogeneous and well vitrified porcelain. The color of the insulator shall be brown and the surface shall have polished glaze. The high voltage bushings shall have clamp-type terminal lugs suitable for terminating 30-120 mm² stranded conductor. The low voltage bushings shall have clamp-type terminal lugs suitable for terminating aluminum conductor compatible to the kVA rating (with 100% factor of safety) of the transformer. The low voltage neutral bushings shall include a clamp-type terminal lug for terminating together an earth-wire and an aluminium conductor of neutral circuit of the LV system.

15.4.10 Temperature rise

Maximum oil-temperature rise and maximum winding-temperature rise above ambient- temperature of 45°C when carrying maximum continuous rated current shall not exceed the following;

- a. In oil by thermometer 50°C
- b. In winding by resistance 55°C

The temperature rise of the insulating oil shall be measured near the top of the main tank.

15.4.11 Gaskets

All sealing washers / Gaskets shall be made of oil and heat resistance nitrile / neoprene/ synthetic rubber bonded with cork gasket. Gasket made with natural rubber and cork shall not be acceptable. The thickness of the tank cover gasket shall not be less than 6 mm before compression.

15.4.12 Clearances

Minimum electrical clearances between the phases and phase to earth shall not be less than the values given below:

Voltage	Medium	Phase to phase, mm	Phase to earth, mm
33 kV	Air	330	320
400 V	Air	75	55

The clearances shall be maintained by fixing the bimetallic connectors in position.

15.4.13 Accessories

The following accessories shall be provided with each transformer.

- ↗ Lower oil filter and drain valve
- ↗ Liquid level gauge
- ↗ Lifting Lug
- ↗ Name plate
- ↗ Tank grounding terminal connector suitable for grounding cable
- ↗ Pressure relief device of explosion-vent type for 25 kVA and higher ratings

15.4.14 Rating and Terminal Marking Plate

Each transformer shall be provided with a non-detachable rating and terminal marking plate of weather proof material, preferably of brass fitted in a visible position mentioning the following information:

- Guaranteed No Load Loss and Load loss
- Details of rating (rated output, voltage, phases, frequency etc.)
- Cooling
- Connection and vector diagram
- Weights (Total, weight of core, weight of winding and weight of oil)
- Name of manufacturer and year of manufacture
- Standards of manufacture
- Physical dimension of the transformer
- Any other relevant information

15.5 Tests

Tests shall be performed in accordance with these specifications in line with relevant IEC standards.

15.5.1 Type Tests (Not Applicable)

The Bidder shall submit, along with the Bid, type test reports (detail) on the following tests performed on identical units.

- Temperature rise tests
- Dielectric Type test
 - i) Impulse voltage tests
 - ii) Separate source AC withstand voltage test

The type test certificates shall be furnished for transformer offered which, in addition to other required data, shall show the actual no-load and full-load losses of the transformer at rated load. For the purpose of evaluation, the higher values of no-load and load losses shall be considered from the values guaranteed by the Bidder and the values given in the type test reports. The test of the transformer shall have been conducted by an internationally accredited independent laboratory.

15.5.2 Routine Tests

During Manufacturing and on Completion, the Transformer shall be subjected to the following Routine Tests but not limited to as laid down in the latest revision of the IEC Publication 60076.

- a) Measurement of winding resistance.
- b) Measurement of voltage ratio and check of phase displacement. c)
- Measurement of short-circuit impedance and load loss.
- d) Measurement of no-load loss and current. e) Dielectric routine tests (IEC 60076-3).
- f) Tests on on-load tap-changers (Not applicable).

The bidders are required to furnish the details of testing facilities available at the manufacturer's premises for conducting the tests listed above in 15.5.2

15.5.3 NEA Lab Test and Field Tests

Before installation of Station Transformer at the site, upon availability of test equipment in the NEA Lab, the following various tests shall be performed:

- i. Measurement of Winding Resistance
- ii. Measurement of Voltage Ratios and check of phase displacement
- iii. Measurement of short circuit impedance and load loss
- iv. Measurement of No Load Loss and No load current
- v. Dielectric Routine test as per IEC 60076-3
- vi. Test on on-load tap changers, where appropriate
- vii. Temperature rise test.
- viii. Measurement of dissipation factor

Also, after Installation of the Station transformer at the site, before

Charging/Commissioning of Station Transformer following works shall be carried out:

- i. Testing of Dielectric strength of Oil
- ii. Filtration of Oil, if necessary
- iii. Insulation Resistance Measurement/Meggaring of Station Transformer
- iv. Setting of Alarm / Trip and cooler Controls and operation Check.
- v. Energization of Station Transformer at no load for 24 hours.

The Contractor shall carry-out the above NEA Lab Tests after delivery in Nepal.

Cost for such tests shall be borne by the Contractor as per prevailing practice of NEA.

6. Losses Value

6.1 The transformer no-load and load losses shall not exceed the following prescribed values.

For 33/0.4/0.23 kV

<i>S.N. Rating</i>	<i>No Load Loss (watts)</i>	<i>Load Loss (watts)</i>
1. 100 kVA, 3-ph	290	1800

15.7. Bid Documentation

15.7.1 The Bidder shall furnish with the Bid, the following documentation:

- a) One (1) clear copy of the IEC standards governing fabrication and testing of the transformers.***
- b) Two (2) clear certified copies of type tests carried out as required by the governing IEC standard and the specifications.***
- c) Two (2) copies of certified outline drawings showing dimensions, arrangements, and locations of all parts.***
- d) A clause-by-clause commentary on the specification, specifying compliance or deviations, if any.***

TECHNICAL PARTICULARS OF 33/0.4 kV STATION TRANSFORMER

TABLE 1

Type	Three-phase, 33/0.4 kV
Rated power	As specified in the Price Schedule
Rated voltage - Primary	33kV
- Secondary	400/230V
Max system voltage - Primary	36 kV
- Secondary	440V
Rated Frequency	50Hz
Connection - Primary	Delta
- Secondary	Grd.Wye
Cooling System	ONAN
Vector group	Dyn11
Rated impedance voltage	3.5 - 4.5%
BIL for windings and bushings for primary side	170 kV
Withstand voltage, 50 Hz, 60 Sec.	
- Primary	70 kV
- Secondary	3 kV
No load tap changer (For 100 kVA and above)	+/- 2.5%, +/- 5% on HV side
Mounting	Platform
Insulation levels (IEC) 76	LI 170 AC 70/AC 3
Insulation temperature class (IEC 76)	A
Maximum allowable noise level at 3 metre hemispherical radius	<44 dB
Applicable standard	These Specifications and IEC

TECHNICAL PARTICULARS OF MAINTENANCE EQUIPMENTS

1. Notebook/Laptop

Feature	Technical Specifications
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	Lenovo Slim 7 14IMH9 (14th Gen Intel Core Ultra 7 155H Processor 32GB RAM 1TB SSD 14" WUXGA (1920 x 1200) 100% DCI-P3 Touch OLED Display Intel Arc Graphics Backlit Keyboard Or equivalent
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Technical Data Sheet

ITEMNo.1: POWER TRANSFORMER

TECHNICAL DATASHEET (To Be Completed By the Bidder)				
S. No	DESCRIPTION	UNIT	NEA REQ	DATA to be Filled
	Rated Capacity		33/11kV, 6/8 MVA	
1	Manufacturer and Country of Origin			
2	Year of manufacturing experience	Years	> 5	
3	Manufacturing's Designation as per submitted catalogue			
4	Applicable standard		IEC	
5	Type		Outdoor, oil immersed, Core Type	
6	Winding /Phase		Three	
7	Cooling		ONAN / ONAF	
8	Ratings			
8.1	Rated MVA	MVA	6/8	
8.1.1	ONAN			
8.1.2	ONAF			
8.2	Maximum Voltage		36	
8.2.1	Primary	kV	12	
8.2.2	Secondary	kV		
8.3	Number of Phases		Three	
8.4	Rated Frequency	Hz	50	
9	Noise Level			
	On ONAN Rating	dB	<73	
	On ONAF Rating Rated Voltage	dB	<75	
10	Temperature Rise			
10.1	Temperature Rise above 45°C ambient			
	- In Oil by Thermometer	°C	50	
	- In Winding By Resistance	°C	55	
10.2	Hottest Spot Temperature in Winding Limited to	°C	55	
10.3	Temperature Indicators Make		AB KHILSTROM, Sweden or Equivalent.	

11	Connection			
11.1	High Voltage		Delta	
11.2	Low Voltage		Star	
11.3	Vector Group Ref in accordance with IEC 76		Dyn11	
12	Taps			
12.1	Type of Tap changer		OLTC	
12.2	Tap Step		1.25%	
12.3	Tap Range		±10%	
12.4	Nos. of Tap		17	
13	Cooling Equipment (For ONAF)			
13.1	Manufacturer/Type			
13.2	Number of Fans Connected			
13.3	Nos			
13.4	Rated Operating Voltage, V ac	V ac	230/400, 50Hz	
13.5	Rated Control Voltage, V	V dc	110	
13.5	Rated Power	kW		
14	OLTC Gear			
14.1	Manufacturer / Type		MR, Germany, ABB, Sweden or Equivalent	
14.2	Rating		Suitable for 33 kV Class	
	- Rated Voltage	kV		
	- Rated Current	A	17	
	- Step Voltage	V		
	- Numbers of Steps	Nos.		
14.3	Control Suitable For,			
	- Remote /Local Operation	Remote/Local		
	- Auto /Manual Operation	Auto/Manual		
	- Parallel Operation	Yes		
	- Master Slave Operation	Yes	230/400, 50Hz	
	Rated voltage of Drive Motor	V ac		
15	Guaranteed losses			
15.1	No Load Losses at Rated Voltage and Frequency on Max. MVA Base.	kW		
15.2	Load Losses at rated Current and at 75°C on max. MVA base	kW		
15.3	Cooler Losses for full load operation on max. MVA base	kW		

16	Impedance at Rated Current and Frequency at 75°C Winding Temperatures on ONAF, MVA Base. (Tolerance $\pm$ 7.5% of the Declared Value)			
16.1	Positive Sequence Impedance at name Plate, Normal Tap	%		
16.2	Positive Sequence at Maximum Voltage Tap (Tap 17)	%		
16.3	Positive Sequence at Minimum Voltage Tap (Tap 1)	%		
16.4	Zero Sequence at Name plate Tap	%		
17	Reactance at rated current and Frequency at 75°C on Maximum MVA base at a name plate tap			
18	Efficiency at 75°C Winding Temperature at PF=0.9		Above 99%	
18.1	At 100% Load	%		
18.2	At 75% Load	%		
18.3	At 75% Load	%		
19	Load in Percentage of Full Load and Power Factor at which maximum efficiency occurs.			
20	Regulation at full Load and at 75C			
20.1	At Unity Power Factor			
20.2	At 0.85 Power Factor Lagging			
21	No Load Current in percentage of rated current referred to HV and 50 Hz			
21.1	At 90% Rated Voltage	%		
21.2	At 100% Rated Voltage	%		
21.3	At 110% Rated Voltage	%		
22	Clearances			
22.1	Minimum Clearances in air-HV/LV	mm		
22.2	Between Phases, Between Phase and Earth	mm		

23	Insulation Level			
23.1	Power Frequency Withstand Voltage (1Min rms)			
23.1.1	Primary	kV	70	
23.1.2	Secondary	kV	28	
23.2	Impulse Withstand Voltage			
23.2.1	Primary	kV	170 (Crest)	
23.2.2	Secondary	kV	75 (Crest)	
24	Details of Oil Preservation System			
24.1	Type		Conservator Type	
24.2	Details of Oil Preservation System			
24.3	If Conservator Type, Urethane Air Cell provided	Yes/No	Yes	
24.4	Volume of Conservator	Cu. m		
24.5	Volume of Oil Between the highest and Lowest Levels	Ltrs.		
25	Pressure Relief Device			
	Min. pressure setting	Kg/cm2		
26	Details of Bushings HV/LV/Neutral			
26.1	Manufacturer/Type			
26.2	Voltage class	kV	36/12	
26.3	Creepage Distance	mm	25 mm/kV	
26.4	Weight of Bushing	Kg		
26.5	Standard Reference		IEC	
26.6	Dry Flash over Voltage	kV	70/28	
26.7	Wet Flash Over Voltage	kV	70/28	
26.8	Impulse Withstand Voltage	kV	170/75	
27	Insulating Oil			
i	Manufacturer and Country of Origin			

ii	Manufacturer's type designation			
iii	Type		Insulating Oil	
iv	Applicable standard		IEC	
v	Technical Specifications			
v.1	Dielectric Breakdown Strength (Min) at 2.5mm gap	kV	30	
v.2	Flash Point(Min)	°C	135	
v.3	Density at 20°C (Max)	g/Cu.cm	0.895	
v.4	Viscosity at 40°C (Max)	mm ² /s	12	
v.5	Viscosity at -30°C (Max)	mm ² /s	1800	
v.6	Acidity Neutralization Value (Max)	mg KOH/g	0.01	
v.7	Sludge Value (Max)		0.1%	
v.8	Pour Point(Max)		-40°C	
v.9	Corrosive Sulphur		Non-Corrosive	
v.10	Water Content(Max)	ppm	40	
v.11	Dielectric Dissipation factor at 90 (Max)	°C	0.005	Clean free from sediment and suspended matter
v.12	Appearance			
vi	PCB Content			
vii	Approx. volume of Oil	Ltrs	Not Detectable	
viii	Whether First filled of Oil with 10% excess provided	Yes/No	Yes	
28	Core Material			
28.1	Maximum flux density at rated voltage on			
	Transformer legs	T		
	Transformer yokes	T		
28.2	Maximum flux density at 110%voltage			
	Transformer legs	T	<1.6	
	Transformer yokes	T	<1.6	
28.3	Grade of core used	Prime		
	Type of Core	CRGO		
	Thickness of core lamination	mm		
	Rated Loss per kg	W/Kg		
29	Maximum current density in windings at rated output:			
	Primary(HV)	A/mm ²		
	Secondary(LV)	A/mm ²		
	Weight of copper in windings:			
	Primary(HV)	Kg		
	Secondary(LV)	Kg		

30	Bushing Current Transformers			
30.1	Numbers of Cores - HV - LV - Neutral	Nos Nos Nos	1 /phase 1 /phase 1	
30.2	Accuracy class/Burden/Ratio - HV/HV Neutral - LV/LV Neutral		PS / 15VA PS /15VA Ratio as required	
31	Lightning Arrestor mounted on - HV - LV	Yes/No Yes/No	Yes Yes	
32	RTCC Panel Details			
32.1	AVR make /Model	MR, Germany, ABB, Sweden or Equivalent		
32.2	Annunciator 12 Windows provided	Yes/No	Yes	
33.3	Indicating Voltmeter	Yes/No	Yes	
34.4	Facilities and Provision as per specification provided?	Yes/No	Yes	
35	Approximate Overall Dimension (L xW xH)			
36	Approximate Weights			
36.1	Core and Coil	kg		
36.2	Tank and fittings	kg		
36.3	oil	kg		
36.4	Total Weight	kg		
37	Delivery of Equipment in Months, following the Award of Contract (Allowing the time for Drawing Approval)	months		
38	Is manufacturer ISO 9001 holder?	Yes/No	Yes	
39	Type test certificate submitted?	Yes/No	Yes	
40	Has manufacturer exported units?	Yes/No	Yes	
41	User's certificate submitted?	Yes/No	Yes	
42	Technical literature / drawings submitted?	Yes/No	Yes	

Signed.....

As Representative for.....

Address.....

Date.....

33kV CIRCUIT BREAKER

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and Country of Origin			
	Model No.			
2	Year of manufacturing experience			
3	Applicable Standard		IEC	
4	Type		VCB Out door	
5	Poles		Three pole	
6	Pole breaking		Three	
7	Rated Voltage			
7.1	Nominal	kV	33	
7.2	Maximum	kV	36	
8	Rated Current			
8.1	Continuous at 45 degree ambient	A	1200	
8.2	Rated interrupting current	kA	31.5	
8.3	Momentary	kA		
9	Frequency	Hz	50	
10	Temperature rise above 45 deg C ambient		As per IEC	
10.1	Contacts	Deg C		
10.2	Terminals	Deg C		
11	Rated short circuit breaking current			
12	Rated short circuit making current			
12.1	Peak	kA		
12.2	RMS symmetrical	kA		
13	Interrupting time at 100% capacity			
13.1	Maximum opening time	ms	60	
13.2	Total interrupting time	ms	60	
14	Closing time	ms		
15	Make time	ms		
16	Maximum current breaking capacity	A		
17	Insulation level			
17.1	Impulse withstand voltage(peak)	kV	170	
17.2	Power frequency withstand voltage	kV	70	
18	Operating Mechanism			
18.1	Type		Spring Loaded	
18.2	Number of mechanism per beaker			
18.3	Single/Three phase autorecloser			
18.4	Operating voltage of closing and tripping coil	Vdc	110	
18.5	Operating voltage range	% of rated voltage		
	Closing		85-110%	
	Tripping		70-110%	
18.6	Closing and tripping current	A		
18.7	Spring charging motor rating			
	Capacity	kW		

	Rated voltage	V	110 DC	
18.8	Time required for the motor to charge the spring completely	Sec	<30	
18.9	Space heater and auxiliary equipment			
18.10	Push bottom for local operation	Yes/No	Yes	
18.11	Selection switch for local and remote control	Yes/No	Yes	
19	Operating counter provided	Yes/No	Yes	
20	Space heater provided for cubicle	Yes/No	Yes	
21	Thickness of sheet steel of cubicle	mm	2	
22	Number of auxiliary contacts	No	6No, 6NC, 6MBB	
23	Operating duty cycle		0-0.3sec-CO-3min-CO	
24	Number of possible operation without maintenance under			
	Rated short circuit breaking current	No		
	Rated Normal Current	No		
25	Porcelain insulator			
25.1	Manufacturer			
25.2	Creepage distance	mm	900	
26	Pad locking provision for local cubicle	Yes/No	Yes	
27	Total weight of the cubicle	kg		
28	Mechanical dimension (LxWxH)			

DISCONNECTING SWITCH

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and Country of Origin			
	Model No.			
2	Year of manufacturing experience			
3	Applicable Standard		IEC	
4	Type		3pole, single throw, outdoor, center rotating	
5	Frequency	Hz	50	
6	Rated voltage			
	Nominal	kV	33	
	Maximum	kV	36	
7	Rated Current			
7.1	Continuous at 45 deg C ambient	A	800	
7.2	Short time for 3 sec at max kV	kA	25	
7.3.	Peak short time current	kA	31.5	
8	Temperature rise above 45 deg C ambient at Normal rated current			
8.1	Contacts	deg C		
8.2	Current carrying parts	deg C		
9	Maximum current the switch can safely interrupt			
9.1	Bus/Line charging current	A		
9.1	Potential transformer magnetizing current	A		
10	Clearance			
10.1	Between live parts and ground	mm		
10.2	Between fixed contact and blade in open position	mm		
11	Insulation level			
11.1	Impulse withstand voltage(peak)	kV	170	
11.2	Power frequency withstand voltage (1min,rms)	kV	75	
12	Main contacts			
	Material of fixed contact		Silver coated Copper alloy	
	Coating of fixed contact		Silver coated Copper alloy	
	Material of moving contacts		Silver coated Copper alloy	
	Coating of moving contacts		Silver coated Copper alloy	
	Material of the contacts of the earthing switch		Silver coated Copper alloy	
	Coating of the contacts of the earthing switch		Silver coated Copper alloy	
13	Material of Terminals			
13.1	Coating of terminals			
14	Operating mechanism		Manual operation	
15	Auxiliary Contacts			



15.1	Type	Convertible or fixed	Convertible	
15.2	Continuous current at 110 V DC	A		
15.3	Material		Copper	
15.4	Contacts silver plated	Yes/No	Yes	
16	No of operation switch can withstand without deterioration of contact	No		
17	Type of interlock furnished		Electrical and mechanical	
18	Are the disconnector and the earthing switch mechanically interlocked to each other	Yes/No	Yes	
19	Insulator			
19.1	Manufacturer			
19.2	Type			
19.3	Ref Standard			
19.4	No of units per stack			
19.5	Power frequency withstand voltage			
	Dry	kV		
	Wet	kV		
19.6	Impulse withstand voltage (1min)			
19.7	Creepage distance in Air	mm		
19.8	Tensile strength			
19.9	Cantilever strength			
19.10	Compression strength			
19.11	Torsional strength			
20	Enclosure Protection		IP-55W	
21	Operating mechanism		Manual gang operated	
22	Type of interlock furnished		Manual	
23	Weight of Isolator	kg		
24	ISO 9001 holder	Yes/No	Yes	
25	ISO 9001 certificate submitted	Yes/No	Yes	
26	Type test certificate submitted	Yes/No	Yes	

CURRENT TRANSFORMER

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and Country of Origin			
	Model No.			
2	Year of manufacturing experience	Years		
3	Applicable Standards		IEC	
4	Type		One phase outdoor, oil immersed	
5	Number of phases	Nos	1	
6	Number of core in each CT	Nos	2	
7	Frequency	Hz	50	
8	Rated primary voltage			
8.1	Nominal	kV	33	
8.2	Maximum	kV	36	
9	Temperature rise above 45deg C ambient at Normal rated current	deg C		
10	Insulation level			
10.1	Impulse withstand voltage	kV	170	
10.2	Power frequency withstand voltage (1min rms)	kV	75	
11	Creepage distance	mm		
12	Short time thermal rating	kA	31.5	
13	Current ratings	A		
13	CT Ratio	A	300-150/5-5A	
14	Rated VA burden	VA	50	
15	Accuracy class		5P20 for protection and 0.5 for metering	
16	Rated thermal VA burden	VA	50	
17	Over load factor	%	200	
18	Dimension	cu mm		
19	Weight	kg		
20	ISO 9001 holder	Yes/No	Yes	
21	ISO 9001 certificate submitted	Yes/No	Yes	
22	Type test certificate submitted	Yes/No	Yes	

POTENTIAL TRANSFORMER

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and Country of Origin			
	Model No.			
2	Year of manufacturing experience	Years		
3	Applicable Standards		IEC	
4	Type		Outdoor, oil immersed	
5	Number of phases	No.	1	
6	Frequency	Hz	50	
7	Rated primary voltage			
7.1	Nominal	kV	33/√3	
7.2	Maximum	kV	36	
8	Temperature rise above 45 deg C ambient at Normal rated current			
8.1	With 1.1 times rated primary voltage continuously	deg C		
8.2	With 1.5 times rated voltage for 30 seconds	deg C		
9	Insulation levels			
9.1	Impulse withstand voltage (peak)	kV	170	
9.2	Power frequency withstand voltage (1 min rms)	kV	75	
10	Creepage distance	mm	825	
11	Open circuit intermediate voltage	V		
12	Ratings			
12.1	Voltage ratio	kV	33/√3:0.11/√3	
12.2	Rated burden	VA	100	
12.3	Accuracy class		3P and 0.5	
12.4	Over voltage factor			
12.4.1	30 seconds		1.5	
12.4.2	Continuous		1.1	
12.5	Connection			
12.6	Secondary fuse			
	Manufacturer			
	Amp. Ratings	A		
12.7	By pass device for protection provided	Yes/No	Yes	
12.8	Knife switch and fuse on secondary provided	Yes/No	Yes	
13	No of secondary windings	No	2	
14	Dimension	mm		
15	Weight	kg		
16	ISO 9001 holder	Yes/No	Yes	
17	ISO 9001 certificate submitted	Yes/No	Yes	
18	Type test certificate submitted	Yes/No	Yes	

LIGHTING ARRESTOR

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and Country of Origin			
	Model No.			
2	Year of manufacturing experience	Years		
3	Applicable Standards		IEC	
4	Type		Outdoor, gapless, zinc oxide	
5	Voltage rating of LA	kV	30	
6	Nominal Discharge Current	kA	10	
7	Surge counter with insulating base furnished	Yes/No	Yes	
8	Minimum power frequency spark over voltage	kV		
9	Maximum 1/50 impulse spark over voltage	kV		
10	Maximum front wave spark over voltage	kV		
11	Maximum switch surge spark over voltage	kV		
12	Number of section per pole			
13	Insulation level			
13.1	Impulse withstand voltage (peak)	kV	170	
13.2	Power frequency withstand voltage (1min rms)	kV	75	
14	Creepage distance	mm	825	
15	Earth terminal and accessories provided	Yes/No	Yes	
16	Surge counter	Yes/No	Yes	
17	ISO 9001 holder	Yes/No	Yes	
18	ISO 9001 certificate submitted	Yes/No	Yes	
19	Type test certificate submitted	Yes/No	Yes	



33kV CONTROL AND RELAY PANEL

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Control and relay panel type			
1.1	Manufacturer and Country of origin			
1.2	Year of manufacturing experience	Years		
2	Control switches			
2.1	Manufacturer and Country of origin			
2.2	Type			
2.3	Current Rating	A		
2.4	Catalog Furnished	Yes/No	Yes	
3	Push Button			
3.1	Manufacturer and Country of origin			
3.2	Type			
3.3	Contact rating continuous	Amp		
	Making current	Amp		
	Breaking current	Amp		
3.4	Catalog Furnished	Yes/No	Yes	
4	Indicating Lamps			
4.1	Manufacturer			
4.2	Voltage ratings	V		
4.3	Wattage	W		
5	Indicating instruments			
5.1	Ammeter			
	Manufacturer and Country of origin			
	Type		Digital	
	Current Range (300-150/5-5 Amp CT operated)	A		
	Accuracy Class		0.5	
	Scale			
	Type of scale			
	Range of indication (300-150/5-5 Amp CT operated)	A		
	Lineal/ Non linear			
	Overloaded range	%	1.5	
	VA burden			
	Catalog furnished	Yes/No	Yes	
	Transducer operated	Yes/No		
6	Voltmeter			
	Manufacturer and Country of origin			
	Type		Static	
	Accuracy class		0.5	
	Scale			
	Range of indication	kV	0-36	
	Linear/Non linear			
	Over scale range	%	1.1	
	VA burden	VA		
	Catalog furnished	Yes/No	Yes	
	Transducer operated	Yes/No	Yes	
7	Apparent power meter (kVA)			
	Manufacturer and Country of origin			
	Type		Digital	
	Rated voltage	kV	$33/\sqrt{3}:0.11/\sqrt{3}$	



	Rated current	A	300-150/5-5A	
	Current range (Transducer operated)	mA		
	Accuracy class		0.5	
	Scale	MVA		
	Type of scale			
	Range of indication		0-10	
	Linear/Non linear			
	VA burden			
	Current coil	VA		
	Voltage coil	VA		
	Catalog furnished	Yes/No	Yes	
	Transducer operated	Yes/No	Yes	
8	kWH Meter			
	Manufacturer and Country of origin			
	Type		TOD (static)	
	Applicable standard		IEC	
	Accuracy class		0.5	
	Import Export meter provided	Yes/No	Yes	
	Rated voltage	kV	33/√3:0.11/√3	
	Rated current	A	300-150/5-5A	
	VA burden			
	Current coil	VA		
	Voltage coil	VA		
	Impulse contact provided 1pulse 100kW	Yes/No	Yes	
	Reverse rotation locking mechanism provided	Yes/No	Yes	
9	Power factor meter			
	Manufacturer and Country of origin			
	Type		Digital	
	Accuracy class		0.5	
10	Annunciators			
	Manufacturer and Country of origin			
	Type			
	Manufacturer's type designation			
	Catalog furnished	Yes/No	Yes	
	Number of inputs (annunciator/event)			
	Number of active points	Nos	24	
	Number of rows		4	
	Number of column		6	
	Type of mounting		Flush	
	Replacement of individual inscription plates and lamps from front panel possible	Yes/No	Yes	
	Sequence of operation as per specification	Yes/No	Yes	
11	Protective Relays			
11.1	Phase Over Current Relay			
	Manufacturer and Country of origin			
	Type		Static Non directional	
	Manufacturer's type designation			
	Applicable standards		IEC	
	Triple pole or single pole		Single*3	



(Handwritten signature)

	Current setting range	% of rated current	5-250%	
	Operating time at 10 times current settings (for TDS=1)	sec	3	
	Reset time	ms		
	Characteristics		IDMT (Standard inverse)	
	Instantaneous unit provided	Yes/No	Yes	
	Current setting range	% of rated current	500-2000%	
	Operating range			
	No Contacts			
	Insulation test as per IEC	Yes/ No	Yes	
	Indication			
	Hand reset flags provided	Yes/No	Yes	
	Light emitting diode provided	Yes/No	Yes	
	Auxiliary DC supply	V	110	
	Technical Literature submitted	Yes/No	Yes	
	Test Certificate submitted	Yes/No	Yes	
11.2	Earth fault relay			
	Manufacturer and Country of origin			
	Type		Static/Non directional	
	Manufacturer's type designation			
	Applicable standard		IEC	
	Triple pole or single pole		Single	
	Continuous overload capacity	x In		
	Current setting range	% of rated current	5-250%	
	operating time at 10 times current setting (for TDS=1)	sec	3	
	Characteristics		IDMT (Standard inverse)	
	Instantaneous unit provided	Yes/No	Yes	
	Current setting range	% of rated current	500-2000%	
	Operating range			
	No Contacts			
	Insulation test as per IEC	Yes/ No	Yes	
	Indication			
	Hand reset flags provided	Yes/No	Yes	
	Light emitting diode provided	Yes/No	Yes	
	Auxiliary DC supply	V	110	
	Technical Literature submitted	Yes/No	Yes	
	Test certificate submitted	Yes/No	Yes	
11.3	Directional Over current Relay		Not required	
	Manufacturer and Country of origin			
	Type		Static/ directional	
	Manufacturer's type designation			
	Applicable standard		IEC	
	Triple pole or single pole		Single*3	
	Current setting range	% of rated current	50-200%	

	operating time at 10 times current setting	sec	3	
	Reset time	ms		
	Characteristics		IDMT (Standard inverse)	
	Instantaneous unit provided	Yes/No	Yes	
	Current setting range	% of rated current	200-1600%	
	Operating range			
	Insulation test as per IEC	Yes/ No	Yes	
	Indication			
	Hand reset flags provided	Yes/No	Yes	
	Light emitting diode provided	Yes/No	Yes	
	Auxiliary DC supply	V	110	
	Technical Literature submitted	Yes/No	Yes	
	Test certificate submitted	Yes/No	Yes	
11.4	Directional Earth Fault Relay		Not Required	
	Manufacturer and Country of origin			
	Type		Static/ directional	
	Manufacturer's type designation			
	Applicable standard		IEC	
	Triple pole or single pole		Single	
	Continuous overload capacity	xIn		
	operating time at 10 times current setting	sec	3	
	Characteristics		IDMT (Standard inverse)	
	Instantaneous unit provided	Yes/No	Yes	
	Current setting range	% of rated current	200-1600%	
	Operating range			
	Insulation test as per IEC	Yes/ No	Yes	
	Indication			
	Hand reset flags provided	Yes/No	Yes	
	Light emitting diode provided	Yes/No	Yes	
	Auxiliary DC supply	V	110	
	Technical Literature submitted	Yes/No	Yes	
	Test certificate submitted	Yes/No	Yes	
11.5	Differential Relay			
	Manufacturer and Country of origin			
	Standard reference			
	Type			
	Voltage rating	V	110	
	Type of Mounting		Flush	
	Operating time setting	ms	<30	
	Sensitivity setting		10-50%xIn	
	Bias setting			
	CT ratio Compensating range			
	Burden for Current Circuit	VA		
	DC Burden	VA		
	Tripping	A		
	Making Current	A		
	Closing load (At 110V DC)	A		
	Ambient Temperature Range	Deg C		

	Auxiliary DC supply	V	110	
	Technical Literature submitted	Yes/No	Yes	
	Test certificate submitted	Yes/No	Yes	
	Restricted Earth Fault Relay	Yes	Yes	
11.6	<i>Auxiliary Tripping and Lockout Relay</i>			
	Manufacturer and Country of origin			
	Type			
	Manufacturer's type designation			
	Applicable standard		IEC	
	Operating Time	ms	<15	
	Does the lockout relay reset by the manually operated or electrically operated reset device			
	Is the cut off contact provided to interrupt the operating coil	Yes/No	Yes	
	Contact rating at 125V DC	A		
	Auxiliary DC supply	V	110	
	Technical Literature submitted	Yes/No	Yes	
	Test certificate submitted	Yes/No	Yes	
11.7	<i>Break Fail Lockout Relay, 86K</i>			
	DC Voltage Rating	V	110	
	Nos. of electrically separate No and NC Contacts			
11.8	<i>Break Failure Lockout Relay BF</i>			
	DC Voltage Rating	V	110	
	Nos. of electrically separate No and NC Contacts			
	Technical Literature submitted	Yes/No	Yes	
	Test certificate submitted	Yes/No	Yes	
12	Construction of Control and Relay Panel			
	Type		Simplex	
	Manufacturer's type designation			
	Applicable Standard			
	Control panel furnished as per specification	Yes/No	Yes	
	Enclosure protection class	IP	IP54	
	Thickness of sheet metal used			
	Front and rear portion	mm	>3	
	Side top and bottom cover	mm	>2	
	All instruments, meters, relays and control switches flush or semi flush type		Flush	
	Ground Bus			
	Material		Copper	
	Size	mm x mm		
	Internal Wiring			
	Type of Insulation			
	Voltage Grade of Wires	V	600	
	Cross Section of Wires	sq.mm	2.5 min	
	Current Circuit			
	Voltage and auxiliary circuit			
	Over all dimension of control board	cu mm		
	Shipping data			
	Size of large package	mm x mm x mm		
	Weight of heaviest package	kg		

DISTRIBUTION BOARD

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Construction of AC DB			
	Type		Simplex/Duplex	
	Manufacturer's Type designation			
	Applicable Standard			
	Control Panel furnished as per specification	Yes/No	Yes	
	Enclosure Protection Class	IP	IP54	
	Thickness of sheet metal used	Mm	>2	
	All instruments, meters, relays and control switches flush or semi flush		Flush	
	Bus			
	Material		Copper	
	Size	mm x mm		
	Rating	A	400A	
	Instruments/Equipments mounted			
	Voltmeter	V	0-400V	
	Ammeter	A	0-200A	
	Control switches			
	MCCB			
	Type		DP	
	Manufacturer			
	Current rating	A	400A	
	Internal wiring			
	Type of insulation			
	Voltage grade of wires	V	600	
	Cross section of wires	sq.mm		
	Current circuit	sq.mm		
	Voltage & auxiliary circuit			
	Number of feeders	Nos		
	MCB used	Yes/No	Yes	
	Type	SP/DP	SP/DP	
	Ratings	A		
	Overall Dimension	mm x mm x mm		
	Shipping data			
	Size of large package			
	Weight of the heaviest package	Kg		
	Delivery of equipment in months following award of contract	Months		
	ISO 9001 holder	Yes/No	Yes	
	ISO 9001 certificate submitted	Yes/No	Yes	
	Technical literature/ drawings submitted	Yes/No	Yes	

BATTERY & BATTERY CHARGER

DESCRIPTION	UNIT	NEA requirement	Bidder offer
Battery			
1. Manufacturer and Country of Origin			
2. Manufacturing experience	years		
3. Type of battery		MFVRLA	
4. Applicable standards		IEC	
5. Number of cells	No.		
6. Number of units	No.		
7. Number of cells in a unit	No.	55	
8. Nominal voltage rating	V	110	
9. Nominal capacity at 27°C at 10 h discharge time to cell end voltage 1.75	AH	240	
10. Ampere capacity at 27°C at 15 min discharge time to cell end voltage 1.75	A		
11. Battery construction (type)			
12. Type of plates			
a) Positive (flat or tubular)			
b) Negative			
13. Type of rack			
- Rack dimensions			
14. Float charging voltage	V		
15. Equalizing charging voltage	V		
16. Boost Charging voltage	V		
17. Internal resistance of one cell	ohm		
18. Short circuit current withstand capacity	A		
19. Float charging current	A		
20. Charging current of a fully discharged battery at 8 hour charging rate	A		
21. End voltage of each cell	V		
22. Charging efficiency of the battery	%		
23. Max. duration in month, the battery can be kept without charging	month		
24. Battery life (guaranteed value)	years	at least 10 yrs.	
25. Rack interconnection furnished?	Yes/No		
26. List of Accessories			
B. Charger			
1. Manufacturer			
2. Type of Charger		constant voltage	
3. Applicable Standard		IEC	
4. Battery charger Output rating	A	75	
5. 10 % excess capacity provided	Yes/No		
6. Battery charger current	A		
7. DC constant load considered	A		

8. time required to fully charge the battery under equalizing/boost charging	Hr./Hrs.	.	
9. Range of DC Voltage variation	%	Yes	
10. Maximum AC input	kVA		
11. Input Voltage, Phase	V, phase	400,3- phase	
11. Ripple	%	<2%	
12. Efficiency of charger at 100 % out put	%		
13. Temperature rise above ambient of 40 degree C			
(a) Solid state elements	⁰ C		
(b) Wound elements	⁰ C		
14. Voltage Regulation(AC)	%		
15. Float voltage adjustment			
16. Equalizing voltage adjustment			
17. Auto equalizing charge provided?	Yes/No	Yes	
18. Timer for equalizing charge provided?	Yes/No	Yes	
19. End switching to limit equipment	type		
20. Manual over-ride switch for selection of float/equalizing charge provided?	Yes/No	Yes	
Delivery of equipment in months following award of contract (allowing time for approval of drawings)	month		
Type test certificate submitted	Yes/No		
Has manufacturer exported units	Yes/No	Yes	
Technical literature submitted	Yes/No	Yes	
ISO 9001 holder	Yes/No	Yes	
ISO 9001 certificate submitted	Yes/No	Yes	

Signed & Stamp:

As Representative for:

Address:

Date:



CONTROL CABLES

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and country of origin			
2	Manufacturer's type designation			
3	Type			
4	Applicable Standards		IEC	
5	Voltage ratings			
	Suitable for max. system voltage	V	1000	
	Voltage grade of the cables	V	600	
	Rated voltage between each conductor and screen	V		
	Rated voltage between two conductors	V		
6	Conductor material		Copper	
7	Conductor			
	Cross section of wires	sq.mm		
	Nos & dia of each core in cable			
	Overall jacket of thickness			
8	Insulating material		Polyethylene	
9	Overall jacket material		PVC	
10	Net weight of the cable	kg/m		
11	Standard drum length	m		
12	Continuous current at 45 deg C			
	in ground			
	in duct			
13	Electrical parameters			
	Resistance	Ohm		
	Reactance	Ohm		
14	Technical literature submitted	Yes/No	Yes	
15	Type test certificate submitted	Yes/No	Yes	
16	Delivery of equipment in months following award of contract	Months		
	ISO 9001 holder	Yes/No	Yes	
	ISO 9001 certificate submitted	Yes/No	Yes	

LV POWER CABLES

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and country of origin			
2	Manufacturer's type designation			
3	Type			
4	Applicable Standards		IEC	
5	Voltage ratings			
	Suitable for max. system voltage	V	1000	
	Voltage grade of the cables	V	600	
	Rated voltage between each conductor and screen	V		
	Type of system earthing		Solidly grounded	
6	Conductor material		Copper	
	Cross section of wires	sq.mm		
	Nos & dia of wires of each conductor			
	Insulating material and thickness		Polyethylene	
	Overall jacket material/thickness		PVC	
	Overall cable diameter			
7	Continuous current			
	in ground	A		
	in duct	A		
8	Electrical parameters			
	Resistance	Ohm		
	Reactance	Ohm		
9	Net weight of the cable	kg/m		
10	Technical literature submitted	Yes/No	Yes	
11	Type test certificate submitted	Yes/No	Yes	
12	Delivery of equipment in months following award of contract	Months		
	ISO 9001 holder	Yes/No	Yes	
	ISO 9001 certificate submitted	Yes/No	Yes	

HV XLPE POWER CABLE

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and country of origin			
2	Manufacturer's type designation			
3	Type			
4	Applicable Standards		IEC	
5	Voltage ratings			
	Suitable for max. system voltage	kV	36 /12	
	Rated voltage between each conductor and screen	kV	36 /12	
	Type of system earthing		Solidly grounded	
6	Conductor material		Copper	
	Cross section of wires	sq.mm.	400 , 185	
	Nos & dia of wires of each conductor			
	Insulating material and thickness		XL Polyethylene	
	Overall jacket material/thickness		PVC	
	Overall cable diameter	mm		
7	Continuous current			
	in ground	A		
	in duct	A		
8	Electrical parameters			
	Resistance	Ohm		
	Reactance	Ohm		
9	Net weight of the cable	kg/m		
10	Technical literature submitted	Yes/No	Yes	
11	Type test certificate submitted	Yes/No	Yes	
12	Delivery of equipment in months following award of contract	Months		
	ISO 9001 holder	Yes/No	Yes	
	ISO 9001 certificate submitted	Yes/No	Yes	

GROUNDING SYSTEM

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Main ground grid conductor material		Copper	
2	Main ground grid conductor size	sq.mm	100	
3	Depth of buried main ground conductor			
4	Material of riser		Copper	
	Cross section of riser conductor	sq.mm	100	
5	Type of joint above and below ground level			
6	Ground electrode			
	Material		Copper clad steel	
	Diameter	mm	16	
	Length	m	as per IEEE 80	
7	Fench grounding included			
8	Cross section of conductor rise for fench ground	sq.mm		
9	Fench separately grounded by electrode	Yes/No	Yes	
10	Calculation for grounding grid length and conductor size furnished	Yes/No	Yes	
11	Earthing system designed for	ohm	<1	

MISCELLANEOUS MATERIALS

S. No	Description	Unit	NEA requirement	Bidders Offer
A	Strain bus and fittings			
1	Manufacturer and country of origin			
2	Nominal sectional area			
3	Nos and Size of wires			
	Aluminum			
	Steel			
4	Overall diameter	mm x mm xmm		
	Steel core			
	Complete conductor			
5	Continuous current at 45 deg C	A		
6	Ultimate tensile strength			
7	Short circuit current 1 sec			
8	Resistance	ohm		
9	Weight	kg		
B	Fittings			
1	Manufacturer and country of origin			
2	Material			
C	Suspension and tension insulators			
1	Manufacturer and country of origin			
2	Manufacturer's type designation			
3	Applicable standard			
4	Size			
	Diameter	mm	254	
	Height	mm	146	
5	No of units per string	No	11	
6	Combined electrical and mechanical failing load	kg	12000	
7	Creepage distance per unit	mm	292	
8	Impulse withstand voltage	kV	120	
9	Dry power frequency withstand voltage	kV	78	
10	Wet power frequency withstand test	kv	45	
11	puncture voltage	kV	120	
12	Technical literature submitted	Yes/No	Yes	
13	Type test certificate submitted	Yes/No	Yes	
D	Post insulator			
1	Manufacturer and country of origin			
2	Manufacturer's type designation			
3	Applicable standard			
4	Rated system voltage	kV	33	
5	Maximum rated voltage	kV	36	
6	Unit size (Diameter)	mm		
7	Unit size (length)	mm		
8	Creepage distance	mm	>900	
9	Insulation level			
	Impulse withstand voltage	kV	170	
	Power frequency withstand voltage (1 min rms)	kV	95	

10	Failing load (bending)	kg		
11	Failing load (torsion)	kg-m		
12	Technical literature submitted	Yes/No	Yes	
13	Type test certificate submitted	Yes/No	Yes	
E	ACSR Conductor			
1	Manufacturer and country of origin			
2	manufacturer's type designation			
3	Applicable standard			
4	Unit size(dia x No of strands)			
5	Overall cross sectional area			
6	Technical literature submitted	Yes/No	Yes	
7	Type test certificate submitted	Yes/No	Yes	
F	Earth Wires			
1	Manufacturer and country of origin			
2	manufacturer's type designation			
3	Applicable standard			
4	Unit size(dia x No of strands)			
5	Overall cross sectional area			
6	Technical literature submitted	Yes/No	Yes	
7	Type test certificate submitted	Yes/No	Yes	

WALL MOUNTED SPLIT TYPE AIR CONDITIONER

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer/Type			
2	Standard Reference			
3	Voltage ratings	V	230	
4	Frequency	Hz	50	
5	Power Consumption	kW		
6	Cooling capacity/Heating capacity	BTU/hr		
7	Compressor Type	Rotary/reciprocating		
8	Fan speed steps	3		
9	Air Swing	Yes/No	Yes	
10	Air filter make/type			
11	Refrigerant type	R410A		
12	Mode of operation			

12kV VACUUM CIRCUIT BREAKER

S. No	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer and country of origin			
2	Year of manufacturing experience			
3	Manufacturer's designation as per submitted catalogue			
4	Applicable standard	IEC		
5	Type	3 Phase , Indoor		
6	Rated Voltage			
6.1	Nominal	kV	11	
6.2	Maximum	kV	12	
7	Rated Current			
7.1	Continuous at 45 degree ambient			
	Incomer	A	1200	
	Outgoing	A	800	
	Trunking chamber	A	2000	
	Busbar/Bus Coupler	A	2000	
7.2	Short time for 1 sec at max. kV	kA	25	
	Momentary	kA		
8	Frequency	Hz	50	
9	Rated short circuit breaking current	kA		
10				
10.1	Peak	kA	62.5	
10.2	RMS Symmetrical	kA		
11	Interrupting time at 100% capacity			
11.1	Maximum Opening time	ms		
11.2	Total interrupting time	ms	60	
12	Closing time	ms		
13	Make time	ms	120	
14	Maximum capacitive current breaking capacity (rms)	A		
15	Insulation level			
15.1	Impulse withstand voltage (peak)	kV	75	
15.2	Power frequency withstand voltage	kV	28	
16	Vacuum chamber			
	Make time			
	Rating	A		
17	Operating mechanism			
17.1	Type		Spring Operated	
17.2	Operating voltage of closing and tripping coil	V DC	110	
17.3	Operating voltage range			
	Closing time	% of rated voltage	85-110%	
	Tripping		70-110%	
17.4	Closing and tripping current	A		
17.5	Spring charging motor rating			
	Capacity	kW		
	Rated voltage	V	110 V DC	
	Frequency	Hz		
	Phase	No		

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

17.6	Time required by motor to charge the spring completely	sec		
17.7	Push button for local/ remote control	Yes/No	Yes	
17.8	Selection switch for local/remote control	Yes/No	Yes	
18	Current transformer			
	Nos of core (incoming and outgoing)		3 and 2	
	Ratio/class/burden	A	1200/600/300/5 800/400/200/5	
	Metering	VA	5P20, 15VA	
	Protection	VA	0.5, 15VA	
	Differential	VA	PS	
18.2	Potential Transformer			
	Type		-	
	Rated Voltage			
	-Primary	kV	11/√3	
	-Secondary	kV	0.11/√3	
	Rated burden	VA	50-50	
	Accuracy class		0.5	
	Insulation level			
	-Impulse withstand voltage	kV	75	
	-Power frequency withstand voltage	kV	28	
	Fuse (HV/LV)			
	Continuous rating	A		
	Symmetric faults rating	kA		
19	Indicating Instruments			
19.1	<i>Ammeter</i>			
i	Manufacturer and country of origin			
ii	Type		Digital	
iii	Current range (300-200-100/1 Amp CT operated)			
iv	Accuracy class		0.5	
v	Scale			
	Range of indication (300-200-100/1A CT operated)	A		
	Linear/Nonlinear			
	Overload range	%	1.5	
vi	VA Burden	VA		
	Is manufacturer ISO holder	Yes/No	Yes	
19.2	<i>Voltmeter</i>			
i	Manufacturer and country of origin			
ii	Type		Digital	
iii	Accuracy class		0.5	
iv	Scale			
	Range of indication	kV	0-15	
v	VA Burden			
	Is manufacturer ISO holder	Yes/No	Yes	
19.3	<i>Apparent Power meter</i>			
i	Manufacturer and country of origin			
	Type			
	Rated voltage	kV	11√3:0.11√3	
	Rated Current	A	400-200-100/5	
	Accuracy class		0.5	



	Range of indication	MVA	0-15 or 10	
	VA burden			
	Current coil	VA		
	Voltage coil			
	Is manufacturer ISO holder	Yes/No	Yes	
19.4	<i>KWh Meter</i>			
i	Manufacturer and country of origin			
ii	Type		Static 3-phase, 4 wire	
iii	Accuracy class		0.2/0.5	
iv	Rated voltage	kV	$11\sqrt{3}:0.11\sqrt{3}$	
v	Rated Current	A		
vi	VA burden			
	Current coil	VA		
	Voltage coil			
vii	Reverse rotation locking mechanism provided	Yes/No	Yes	
	Is manufacturer ISO holder	Yes/No	Yes	
19.5	<i>Annunciators</i>			
	Manufacturer and country of origin			
	Type			
	Number of active points	No	4	
	Type of mounting		Flush	
	Replacement of individual inscription plates and lamps from front panel possible	Yes/No	Yes	
	Sequence of operation as per specification	Yes/No	Yes	
20	Protective Relay			
20.1	<i>Over current relay</i>			
iv	Manufacturer and country of origin			
ii	Type		Static Non-directional	
iii	Manufacturer's type designation			
iv	Applicable standard			
v	No of poles		Three	
vi	current setting range	% of rated current	20-200%	
vii	Operating time at 10 times current setting (for TDS=1)	sec	3	
viii	Reset time	ms		
ix	Characteristics		IDMT (standard inverse)	
x	Instantaneous unit provided	Yes/No	Yes	
	Current setting range	% of rated current		
	Operating range			
	No Contacts			
xi	Insulation test according to IEC	Yes/No	Yes	
xii	Indication			

	Hand reset flags provided	Yes/No	Yes	
	Light emitting diode provided	Yes/No	Yes	
xiii	Auxiliary DC supply	V	110	
xiv	Technical literature provided	Yes/No	Yes	
20.2	<i>Earth fault relay</i>			
i	Manufacturer and country of origin			
ii	Type		Static/Non-directional	
iii	Applicable standard		IEC	
iv	Continuous overload capacity	xIn		
v	Current setting range	% of In	10-80%	
vi	Operating time at 10 times current setting	sec	3	
vii	Characteristics		IDMT (standard inverse)	
viii	Instantaneous unit provided	Yes/No	Yes	
	Current setting range	% of In	200-1600%	
	Operating range			
	No Contacts			
ix	Insulation test according to IEC	Yes/No	Yes	
x	Indication			
	Hand reset flags provided	Yes/No	Yes	
	Light emitting diode provided	Yes/No	Yes	
xi	auxiliary DC supply	V	110	
xii	Is Manufacturer ISO 9001 holder?	Yes/No	Yes	
xiii	Technical literature submitted	Yes/No	Yes	
xiv	Type test certificate submitted	Yes/No	Yes	
20.3	<i>Auxiliary Tripping and Lockout Relay</i>			
i	Manufacturer and country of origin			
ii	Type			
iii	Manufacturer's type designation			
iv	Applicable standard			
v	Operating time	ms	<15	
vi	Contact rating at 125V Dc	A		
21	Earthing switch			
	Type		Integrated	
	Rating			
	Interlocking	Yes/No	Yes	
22	Surge Arrestor			
	Type		ZNo	
	Rating	kA	9kV,10kA	
23	Space heater provided for cubicle	Yes/No	Yes/rating	
24	Operating duty cycle		0-0.3sec-co-3min-co	
25	Number of possible operation without maintenance under:			
	Rated short circuit braking current	No	100	
	Rated Normal current	No	10000	
26	Clearances			
26.1	Phase to phase	mm	127	
26.2	Phase to earth	mm	76.2	
27	Padlocking provision for cubicle	Yes/No	Yes	

28	Total weight of the circuit breaker	kg		
29	Mechanical Dimension (LXWXH)	mm x mm x mm		
30	Delivery of equipment in months following award of contract (Allowing time for approval of drawing)			
31	Type test certificate submitted	Yes/No	Yes	
32	Has manufacturer exported units	Yes/No	Yes	
33	Technical literature submitted	Yes/No	Yes	
34	ISO 9001 holder	Yes/No	Yes	
35	ISO 9001 certificate submitted	Yes/No	Yes	

100 KVA, 33/0.4 kV STATION TRANSFORMER

Item	Description	Unit	NEA requirement	Bidders Offer
1	Manufacturer			
2	Copies of IEC standards attached?	Yes/No	Yes	
3	Copies of type test for each rating attached?	Yes/No	Yes	
4	Copies of outline drawings for each size attached?	Yes/No	Yes	
5	Winding material:		Copper	
6	Primary Winding BIL	kV		
7	Primary Bushing BIL	kV		
8	Accessories listed below furnished?			
a	Lower oil filter valve	Yes/No	Yes	
b	Liquid level guage	Yes/No	Yes	
c	Lifting lugs	Yes/No	Yes	
d	Hand hole	Yes/No	Yes	
e	Tank earthing terminal	Yes/No	Yes	
f	Overload protection If yes, details attached?	Yes/No	Yes	
9	Testing facilities available at Manufacturer's Plant			
	Applied voltage test	Yes/No	Yes	
	Induced voltage test	Yes/No	Yes	
	No load loss and excitation current test	Yes/No	Yes	
	Impedance voltage and load loss tests	Yes/No	Yes	
	Resistance measurement	Yes/No	Yes	
	Ratio tests	Yes/No	Yes	
	Polarity and phase relation tests	Yes/No	Yes	
	Leakage tests	Yes/No	Yes	
	Insulation resistance tests	Yes/No	Yes	
	Temperature rise test	Yes/No	Yes	
	Dielectric Type test	Yes/No	Yes	
	Tank pressure test	Yes/No	Yes	
10	Design information			
	Rated kVA (IEC rating)	kVA	100	
	Number of phases	Nos	3	
	Frequency	Hz	50	
	Voltage ratio at no-load	kV	33/0.4	
	Winding connections	Dyn-11	Delta/Star	
	Type of core sheet			
	Magnetising current at normal ratio			
	HV	Amp		
	LV	Amp		
	Maximum flux density in core iron at normal voltage and frequency based on the net section of iron:			
	Cores	T		
	Yokes	T		
	Type of winding			
	HV			
	LV			
	Maximum current density in winding at rated power:			
	HV	Amp/mm ²		
	LV	Amp/mm ²		
	Type of insulation used for:			



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Item	Description	Unit	NEA requirement	Bidders Offer
	HV Winding			
	LV Winding			
	No-load loss at normal voltage ratio and 75°C	Watt		
	Load loss at rated current and at 75°C	Watt		
	Regulation at 75°C and rated power as a percentage of normal voltage:			
	at 1 p.f.	%		
	at 0.8 p.f	%		
	Impedance voltage at 75°C and rated power:			
	at normal tapping	%		
	at -5% tapping	%		
	at +5% tapping	%		
	Efficiency at 1 p.f and 125% load	%		
	Efficiency at 1 p.f and 100% load	%		
	Efficiency at 1 p.f and 75% load	%		
	Efficiency at 1 p.f and 50% load	%		
	Efficiency at 1 p.f and 25% load	%		
	Load at which maximum efficiency will occur	%		
	Maximum efficiency	%		
	Temperature rise at rated kVA by thermometer in oil	°C		
	Temperature rise at rated kVA by resistance of windings	°C		
	Permissible overload	%		
	Transformer insulating oil specification			
	Total volume of insulating oil at 20°C	Ltrs		
	Effective expansion capacity of conservator	Ltrs		
11	Approximate weight and dimensions			
	Weight of core	Kg		
	Weight of winding	Kg		
	Weight of tank and fittings	Kg		
	Weight of oil	Kg		
	Total weight	Kg		
12	Radiator details			
	No of radiators per transformer	Nos		
	No. of fins per radiator	Nos		
	Width of each fin	mm		
	Thickness of radiator	mm		
13	Tank dimensions			
	Length	mm		
	Breadth	mm		
	Height	mm		
	Tank sheet thickness (sides x bottom x top)	mm		
14	Approximate dimensions including fittings			
	Overall length	mm		
	Overall width	mm		
	Overall height	mm		
15	Winding resistance values			
	Per phase resistance of HV winding	ohm	AB.....BC.....CA.....	
	Per phase resistance of LV winding	ohm	an.....bn.....cn.....	



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SPECIFICATION OF CIVIL & BUILDING WORKS

1. SITE WORKS

Work Included

Furnishing all materials equipment and labor and performing all operations required for the clearing stripping, Filling and compacting of substation areas and constructing access roads so indicated on the drawings, specified herein and as evidently necessary to complete to work as given in the price schedule.

1.2 Clearing and Stripping

1.2.1 General

Clearing shall include cutting, leveling, removal and disposal with lead of 100 m, as specified of all trees, bushes down timber, debris, posts, fences, indicted structures and other obstructions from the areas to be occupied by permanent works of the contract and as indicated on the drawings specified herein and directed by the Owner/Engineer. Areas so indicated shall be stripped of 20 cm thick topsoil. Topsoil approved by the Owner/Engineer shall be stockpiled for use in the finish grading and seeding work. Stockpiled topsoil shall be free from trash, vegetation, or other debris.

1.2.2 Protection

The Contractor shall be responsible for prevention of damage to structures and other objects, which are not included in the clearing work. No objects of any kind outside the indicated limits of the work shall be removed or damaged. Existing utilities which are not specifically include in the work shall be protected by the contractor. The contractor shall be responsible for employment of safe methods of demolition and clearing.

1.2.3 Payment

Payment for the contract item “Clearing and stripping” will made at the lump sum price as bid therefore in the schedule which shall include full compensation for all costs incurred in performing the clearing and stripping, including but not limited to removal and disposal of bushes, splash, roots and debris and stripping, stockpiling and disposal of topsoil or unsuitable earth material within lead of 100 meters.

1.3 Compacted Fill for Site Grading

1.3.1 The contractor shall provide and compact select borrow material within the limits of the work to the lines, grades and elevations to be specified by the Owner/Engineer. In general, the new substation sites and access roads will be elevated by approximately one meter from the existing ground level. The contractor shall provide details of filling for approval of the owner.

1.3.2 Common Fill

The contractor may use fill materials available from cut areas in the switchyard if suitable and approved by the owner. This materials shall be well-graded bank-run gravel, relatively free from clay, loan on vegetables matter and with no stones over 10 cm in maximum dimensions, or materials of equivalent strength and characteristics. Representative samples from proposed borrow sources

shall be submitted to the Owner/Engineer for approval of the borrow source. Approval of borrow source shall both mean automatic approval of Owner/Engineer. If Owner/Nepal Electricity Authority rejects any material the Contractor shall remove it from site without any extra cost to the Owner.

1.3.3 The Contractor shall, at his option, use areas approved by the Owner/Engineer for production of select borrow or at his own expense, make arrangements for obtaining select borrow at other sources with prior approval of the Owner/Nepal Electricity Authority.

1.3.4 Unless otherwise specified by the Owner/Engineer, compacting shall be to the following sensitizes at optimum moisture contents as determined by ASTM D-1557, Method D.

a) Fill location and required density

- | | |
|---------------------------------------|------------|
| 1) Under building and yard foundation | 95 percent |
| 2) Sub-base for roadways | 90 percent |
| 3) Gravel roadways top 400mm | 95 percent |
| 4) All other locations | 90 percent |

b) It is Contractor's responsibility to select his method for attaining the required compaction and obtain approval of the Owner/Engineer for the proposed method. Should the method of compaction prove unsatisfactory, it is the Contractor's responsibility to take remedial measures and obtain the approval of the Owner/Engineer for the changes made. For the compaction of fill, 2 ton vibrating roller is preferable.

c) The Owner/Engineer reserves the right to have compaction tests performed by an independent laboratory, with all testing costs borne by the Contractor. Any additional compaction or replacement of fill required to meet the specified density, as evidenced by the tests, shall be done by at the expense of the Contractor.

d) Failure of the compacted fill to reach the required density as evidenced by these tests, is cause of rejection by the Owner of the work in the affected area(s). Unless the Contractor can rework and compact the fill to the required density, he shall remove the fill in the areas affected. Subsequently the Contractor shall replace the removed fill with material which he can compact to the required density.

e) Compaction shall be carried out in layer wise, each layer not exceeding 300 mm loose thickness.

1.3.5 Measurement for payment for the contract item, "Site Grading" shall be the number of cubic meters of site grading, filled of bank run gravel furnished and placed in accordance with the Specifications, as shown on drawings, or as directed by the Owner/Engineer. The measurement and the payment shall be for compacted volume.

1.3.6 Payment for the contract item, "Site Grading" will be made at the unit price for cubic meter. Bid therefore in the price schedules which unit price shall include full compensation for all costs incurred in furnishing all materials and all other operations related to fill including but not limited to:

- a) Obtaining materials to job site from source, to temporary stockpiles and/or points or final disposition.
- b) Transporting, materials to job site from source, to temporary stockpiles and/or points or final disposition.
- c) Leveling the top surface to the finish grade.

1.4 Crushes Stone Substation Yard Surfacing

1.4.1 The Contractor shall furnish, delivery, deposited and spread crushes stone on the switchyard area. The crushes stone shall be crushes granite, gneiss or equal, 25mm size and shall be hard, durable and seamless, spread and bladed dense but not compacted. The Contractors shall spread the crushes stone on previously properly prepared sub surfaces. The cover shall be 150mm thick.

1.4.2 Measurement for payment for contractor item. Crushes Stone for Substation Yard surfacing, shall be at the number of square meters of crushes stone surface of crushed stone furnished and placed in accordance with Specification, as shown on deducting area cover by permanent structure and fixtures.

1.4.3 Payment for the contract item “Crushed Stone for Substation Surfacing” will be made at the unit price per square meter therefore in the Schedule, which unit price shall include full compensation for all costs incurred in furnishing all materials and all other operation related to the fill including but not be limited to:

- a) Obtaining materials from owner/Engineer approved source.
- b) Transporting materials to job site from source, to temporary stockpiles and/or to points of final disposition.

1.5 Site Drainage

1.5.1 The Contractor shall design and furnish all construction works for collection and disposing storm water all around the switchyard site into the soak pit drain or nearby channel.

1.5.2 Grading

Location and its direction of the elevations shall be as per approved drawings.

1.5.3 Drainage channel materials

- a) All concrete drains must be built to tall

Excavating must give allowance to formwork, which shall be refilled with proper compaction.

- b) Concrete pipes

Concrete pipes shall be Np-3 class or equivalent in required size. Closed pipes shall be used at road crossing, the perforated type pipes shall be used for switchyard area. 150 mm dia. Perforated pipe shall be made of asbestos cement.

250 mm and 200mm dia. Perforated pipe shall be made of R.C.C hume pipe Np-2 class or equivalent. Those pipes shall be protected with screened gravel of 25mm-40mm size.

1.5.4 Construction

Excavating, trenching and backfilling for drainage channels shall be done after all other underground utilized are installed but before road sub grade is prepared.

a) Trench Excavation

Trenches for pipe shall excavated to a sufficient depth and width to enable to pipe and any specified joint bedding, hunching etc. to be accommodated.

b) Bedding and laying of pipes

Immediately following excavation of trenches, pipes shall be laid. Pipe shall be laid so that each one is in contact with the bed throughout the length of its barrel.

c) Jointing of pipes

Length of each pipes shall be commercially available joints to be constructed in the fields shall be factory made collar jointed with jute packing and cement sand mortar 1:3. And the joint location shall be covered by 30cm thick concrete (1:2:4).

d) Backfilling

After 48 hours of pipe jointing, the trenches shall be backfilled with excavated materials. IF excavated materials is not suitable then the contractor shall replace it by select borrow. Backfilling shall be done in layer wise, each layer not exceeding 15 cm.

1.5.5 Open channel type drainage

Excavation and backfilling for this type of drainage shall be done as specified herein. The surface shall be made as smooth as possible with plaster work. Side and base shall be constructed in stone masonry wall 360 mm thick and cement sand mortar to be used shall be 1:5 ratio by volume.

1.5.6 Payment for the contract item "Drainage" will be made at lump sum bid price. Therefore in the schedule the bid price shall include full compensation for all costs incurred in furnishing all materials, equipment labor and other operations related to the scope of work.

1.6 Laying of underground cable

Contractor shall furnish all construction work for under grounding of 12 kV cables from

substation outgoing cable exit point to nearest take off poles.

This work shall include excavation, sand filling from the top and backfilling. All work shall be done according to the standard practice.

Cost of “12 kV power cable and accessories: in the Price Schedule shall include the cost of laying of cable with required materials as described above.

1.7 Cable Trenches

1.7.1 General

Concrete cable trenches of adequate size shall be designed and constructed in accordance with the drawings and as directed by the Owner/Engineer. Trenches shall be designed with floor drains to assure proper drainage and shall be equipped with floor drains to assure proper drainage and shall be equipped with removable iron covers. At road crossing R.C.C. Hume pipe - NP3 of sufficient size shall be provided. The detailed design shall be approved by the Owner.

1.7.2 Payment

Payment for the contract item, cable trenches, will be made at the unit price per meter bid. Therefore, in the schedule the unit price shall include full compensation for all costs incurred in furnishing all materials, equipment and labor and all other operations related to cable trench, design and construction, including but not be limited to:

- a) Performing detail designs and preparation of construction drawings b)
Supplying transporting all materials to job site.
- c) Excavating and backfilling for the cable trenches.
- d) Construction the cable trenches with floor drains, reinforced concrete wall, base and removable cover.

1.8 Access Road

Asphalts Payment

General

This specification covers all construction works for 4 meters wide drive-way road within Owner's premises.

Grading

Finish grade of roads and packing area shall be as directed by Owner.

Pavement Materials

Sub-base

Sub-base shall be a non-plastic, sandy granular material with a C. B. R value greater than 15. It shall be free of deleterious materials and subjected to the Owner's approval. Thickness of sub-base course shall be 30 cm compacted.

Base Course

Base shall be crushed aggregate with a CBR value greater than 80. It shall be free of deleterious material and subjected to the Owner's approval. Thickness of base course shall be 15 cm compacted.

It shall conform to following gradation :

Sieve Size	Percentage Passing
1.5 "/2	100
3/4"	90-100
3/8"	50-80
No. 4	35-55
No. 30	10-30
No. 200	2-9

Wearing Course

Wearing course shall be asphalt concrete mixture.

Asphalt Concrete Mixture

Asphalt concrete shall be a mixture of mineral aggregate and paving asphalt mixed at a central mixing plant. Its components shall be specified herein.

Paving asphalt shall be a stream refined asphalt produce from crude asphaltic petroleum or mixture of refined liquid asphalt and refined solid asphalt. It shall be homogeneous and free from water and residues of coal, coal tar or paraffin oil. It shall have a penetration grade of 85-1000 when tested according to ASTM D-5.

Aggregate for asphalt concrete shall be a composition of coarse aggregate fine aggregate. Both shall be clean and durable.

Composition of Grading

The grading of the combined aggregates and the percentage of asphalt shall be as follows:

Percentages shown are based on weight of dry aggregates.

Sieve Size	Percentage Passing	
	Minimum	Maximum.
¾"	100	
½"	95	100
3/8"	72	88
No.4	46	60
No.8	28	42
No.30	15	27
No. 50	10	20
No.200	4	7
Asphalt content (%)	4.8	6.0

Payment

The unit price bid in the price schedule shall include the cost of design, all labor all material, civil construction works, etc.

Payment for the contract item “ Asphalt Road” will be made at the unit price per sq. meter of finished blacktop surface bid therefore in the price schedule, which unit price shall include fill compensations for all costs incurred in grading, furnishing all material, equipment labor and all other operations including earthwork and excavations.

1.9 Stone Masonry for Protection

The Contractor shall design and construct stone masonry wall to protect the different level of switchyard, control building, road and other places as directed by the Owner.

The stone shall be placed with uncoursed close joints to the lines and grades as designed. The rubble stone shall be placed with 1:3 cement mortar. After completion of masonry wall, it shall be cured with water for more than 10 hours.

Weep-holes with poly vinyl chloride (PVC) pipes of 5 cm in diameter shall be made in each 4 sq. m of slope surface of the masonry wall. The upper surface of the masonry wall shall be finished smooth with concrete.

Payment: Measurement for payment of “Stone Masonry Wall” works shall be made for the number of cubic meters measured as provided at the unit price specified in the Price Schedule. The unit price shall include all labor tools and equipment materials including furnishing, transporting and placing the materials, excavating, backfilling, installation of PVC pipes and all other costs necessary for the performance and completion of the works.

1.10 Switchyard and Boundary Fencing

A barbed fence shall be constructed around Owner’s premises as shown on the drawings.

The work include under this item entails the complete furnishing and installation of all galvanized wire fencing, posts, and appurtenances, complete and in finished condition, including the furnishing of all labour, materials, plant, tools and equipment required for the work.

The contractor shall erect the boundary fence strictly conforming to this specification. Concrete work shall be in accordance with the details in the item of these specifications concerning concrete work.

Payment

The unit price bid in the Price Schedule shall include the cost of all labor and all materials.

Measurement for payment shall be made on the basis of running meter of actual quantities performed and be made at the unit price bid therefore in the price schedule, which shall include earth excavation, backfill and all other related works.

1.11 Entrance Gate

One entrance gate for main entrance to the Owner's premises and another one for the switchyard shall be erected. The iron gates shall be 4.5x1.5 (wxh) m. the Contractor shall submit the design for the approval of Owner.

Excavation, backfilling, pilling (if necessary) for installations of gate posts are included and the gate shall be painted according to the direction of the Owner. Measurement for payment shall be made on the basis of actual quantities performed and made at the unit price bid therein.

Payment shall be made on the basis of lump sum price and be made at the unit price bid therefore in the Price Schedule.

2. CONCRETE FOUNDATION AND TRENCHES

Work Included

Furnishing all materials, equipment and labor and perform all operations required for the design and construction of all the concrete foundations for equipment and other structures, oil containment and cable trenches, as specified herein and as evidently necessary to complete the work.

2.2 Foundation Design

2.2.1 General

The Contractor shall design all foundations specified on the bid drawings. The design shall be based on assumed soil parameters. Upon completion of the detail soil test, actual soil conditions shall be investigated and shown to be in compliance with the assumed condition.

2.2.2 Submittals

The Contractor shall submit design calculations, detail drawings and reinforcement steel schedules to the Owner/Engineer for review and comment before construction commences, Review of the foundation design by the Owner/Engineer in no way relieves the Contractor of his responsibility for an adequate foundation design, even though this Specification sets forth the basis foundation design criteria. Upon receiving the Owner's /Engineer comments, the Contractor shall submit to the Owner/ Engineer final drawings of all foundation details, including reinforcement steel schedules on drawing sheet sizes for record file.

2.2.3 Design Load

The structure design loads are defined on the structure outline drawings and the loads used to design the foundation shall be actual working loads applied to the foundations by the equipment and structures. The foundations shall be designed to resist all vertical and lateral forces, uplift forces and overturning moments with a minimum factor of safety of 1.5.

2.2.4 Bearing Loads

The Contractor shall use an allowable soil bearing pressure of 1.0kg/cm² for the design of the foundation for the purpose of bidding, but this is only a reference value. After award of contract the Contractor shall carry out detailed soil test and detailed design of foundation based on the soil test result. There may be variation in the volume of work in final design compared to the bidding design, for which the Contractor will not get any extra payment.

2.2.5 Uplift and Overturning Loads

The uplift and overturning resistance of concrete spread footing shall be assumed as the weight of a volume of earth in the form of an inverted frustum of cone or pyramid. The cone or pyramid height shall be 30cm less than the depth from finish grade to the top of the concrete mat, the base area shall be the top area of the mat and the top area shall be determined by the intersection of planes starting at the mat edges and sloping outward at a 20 degree cone angle from the vertical and the horizontal plane 30 cm below finish grade.

2.2.6 Unit weight for overturning resistance

The following unit weight shall be used for design: a)

Soil		12,000kg/m ³	b)
Concrete.....		16,00kg/m ³	

2.2.7 Payment

No separate or direct payment will be made to the Contractor for design works. All costs incurred in connection therewith shall be included in the lump sum bid price for the construction of various works.

2.3 Soil Test

2.3.1 Ground bearing tests

The contractor shall carry out soil tests to determine the ground bearing capacity by means of a Standard Penetrations Test and Auger Boring and tests shall be performed in accordance with the following Specifications.

a) The Contractor shall perform soil investigation work according to the approved plan and details of tests. Report on test results including various data collected during the investigation works and Contractor's recommendations, on which the design will be based, shall be approved Owner/Engineer.

b) Sub surface investigation for soil strength of foundation for structures and equipment shall conform to the following requirements.

Number of boring shall be at least 2 borings at the locations specified below:

- One at take-off structure foundation

- One at transformers foundation
- c) Thin-walled tube soil sampling in accordance with ASTM D-1587-63 T shall be made at every meter for the first three meter of depth.
- d) Standard penetration tests in accordance with ASTM-D-1586-64T shall be made at every meter for the first three meter of depth and every two meters for the further depth after thin-walled tube soil samples have been taken.
- e) Every undisturbed sample collected from thin-walled tube shall be subject to the following series of test.
 - Natural moisture content
 - Atterberg limits
 - Sieve analysis
 - Unit weight
 - Specific gravity determination
 - Unconfined compression tests.
- f) Accurate log of all soil strata penetration resistance test unconfined compressive strength, soil classification, ground water table and other tests result shall be recorded in the reports submitted.

The Contractor shall provide all necessary equipment, materials and personnel to prepare conduct and report the tests.

2.3.2 Payment

Payment for the contract item: Soil Testing will be made at the lump sum price bid. Therefore, in the schedule, the price shall include compensation for all costs incurred in furnishing all materials and labor and other operations related to soil testing.

2.4 Excavation and Backfill

2.4.1 The contractor shall excavate earth, rock, stumps and all the other materials encountered as required for construction of the foundations, oil containments and trenches and drainage pipes. The Contractor shall place all suitable excavated materials in backfill or in graded embankment in the immediate area at structures. Materials found to be unsuitable for foundation backfill or grading shall be wasted and disposed of at Contractor own expense, and shall be backfilled with select borrowing material.

2.4.2 Excavation shall be maintained in a clean, safe and sound condition until completion of the foundation construction and shall be diked to prevent flooding by surface runoff. Suitable pumping equipment shall be provided and used to dewater excavation so that all installation work and backfilling is performed in the dry state. Any previously prepared foundation bearing surface that is softened by water runoff or otherwise contaminated before placement of the

structure foundation shall be excavated and replaced at the Contractor's expenses.

2.4.3 In those excavation where the base is unstable. Lies below groundwater level, or has been over excavated, the Contractor shall furnished and place a layer of crushed stone, or selected backfill, or borrow to stabilize the base for placement of foundation.

2.4.4 Backfill shall be place in not greater than 20cm lifts before compaction. Each lift shall be thoroughly compacted before the following lift is placed, Pneumatic or equivalent tempers shall be used on cohesive materials: vibratory compactors shall be used on non- cohesive materials. Compaction shall achieve a density at least equal to that of the surrounding undisturbed earth. Large stones or rock fragments may be used in the backfill provided they do not interfere with proper compaction. Particles larger than 25 cm shall be placed not nearer than 0.5 m of the structure and at least 1.0m below ground surface.

2.4.5 Rock particles larger than 10 cm shall not be in contact with the concrete.

2.4.6 Upon the completion of excavation a 10 cm thick layer of boulder or selected borrow shall be provided at the base of each foundation.

2.4.7 Payment

No separate or direct payment will be made to the Contractor for excavation and backfill. All costs incurred in connection therewith shall be included in the lump sum bid prices for the construction of the various foundation types.

2.5 Foundation Construction

2.5.1 General requirement

All materials and labor required to remove and replace at his expense any materials incorporated in the work that do not conform to these Specifications.

a) The Contractor will be required to remove and replace at his expenses any materials incorporated in the work that do not conform to these Specifications.

b) The Contractors shall furnish without extra cost all materials the Owner/Engineer may required for testing. The cost of the tests shall be borne by the Contractor.

2.5.2 Measurement

Measurement for payment for the contract item: Concrete foundation, shall be on the basis of the actual number of each type of foundation constructed by the Contractor.

2.5.3 Reference to standard specifications

Standard referred to in these specifications are as follows.

a) ASTM refers to the latest edition of publications of American Society for Testing and Materials.

b) ACI refers to the latest edition of publications of American Concrete Institute.

2.5.4 Measurement Standard

Measurement standards referred to in these Specifications, gallons shall be understood to be U.S gallons.

- a) Gallons – whenever used in these Specifications, gallons shall be understood to be U.S gallons.
- b) Bag- Wherever used in these Specifications, bag will be understood to mean 50 kg bags of Portland cement.

2.5.5 Concrete

The Contractor shall design and test concrete mixes which have a 28 days specified compressive strength of 210kg/sq.cm.

- a) At least on month prior to the placement of any concrete, the Contractor shall test cylinders for each trial mix under both field-cured and laborated cured conditions. The test cylinders shall be made and tested in accordance with the applicable standards. Also for every new batch of cement purchased one set of test cylinders shall be taken before two weeks of using that cement.
- b) The concrete mixes be of such proportions as to produce a plastic and workable mix which will not separate during placing and will finish sell without using excessive quantities of mixing water.
- c) After the test results are known for the test cylinders, the Contractor shall submit test result to Owner/Engineer then Owner/Engineer will notify the Contractor of the acceptable design mixes.
- d) When placing concrete in hot weather, the recommendations of the American Concrete Institute's publication "Recommended, Practice for Hot Weather Concreting"(ACI 605) shall be followed in so far and the Owner/Engineer may direct. The use of set retarders will be at the Owner/Engineer's discretion. For concrete placed during extremely hot weather, the aggregate shall be collected by frequent water spraying in such a manner as to utilize the cooling effect of evaporation. Concrete with a temperature of 30 deg. C high before placement will be rejected and shall be wasted at the Contractor's expense.

2.5.6 Cement

In locations where conditions do not required high sulfate resistance, cement shall conform to the requirements of ASTM C150 type 1.

- a) In locations where, in the opinion of the Owner/Engineer, the conditions required the use of high sulfate resistance cement, conforming to the requirements of ASTM C150 type V shall be used without any extra cost to the Owner.
- b) The aggregates shall consist of clean, natural materials or, subject to the approval of the Owner/Engineer, manufactured aggregate may be used.

c) Aggregates shall be separated into sand and coarse aggregate before being used. No pit or crusher run materials will be permitted without prior approval of the Owner/Engineer.

d) Natural fine aggregate or sand grading shall be within the following limits and the fitness modules shall be between 2.5 and 2.8.02

Sieve Size	Amount finer than each Laboratory
U.S. Std.	Sieve, Weight Percent
3/8" (9.5mm)	100
# 4 (4.75mm)	95 to 100
# 8 (2.36mm)	80 to 10
# 16 (1.16mm)	50 to 85
# 30 (600micron)	25 to 60
# 50 (300 micron)	10 to 30
# 100 (100 micron)	2 to 10

c) Natural coarse aggregate grading shall be within the following limits, depending upon the nominal size of the coarse aggregate.

U. S Standard Sieve	Nominal 1-1/2"	Nominal 3/4" (19mm)
2" (50.8mm)	100	
1-1/2" (25-38mm)	95-100	
1" (25mm)		100
3/4" (19mm)	35-70	90-100
3/8" (9.5mm)	10-30	20-55
No. 4 (4.75mm)	0-5	0-10

2.5.7 Slump

All the concrete shall have a maximum slump of 102 mm and minimum slump of 75 mm at the time of placing. The water-cement ratio shall be determined by consideration of the specified strength, the water reducing admixtures, the slump required for proper placement, air entraining requirements, the available and maximum allowable aggregate size and its specific gravity the fitness modulus of the fine aggregate and its specific gravity and the amount of water carried on the aggregates. The slumps and maximum sizes of aggregate as well as the computation of trial mixes shall be as described in the American concrete Institute Recommended Practice of Selecting Proportions for Concrete (ACI 613) The minimum amount of cement per cubic meter of concrete using

8mm aggregate, shall be 6 bags (300kg) for a concrete design strength of 210kg/sq. cm. But if 210 kg/cm² strength of 28 days concrete cannot be achieved with this cement content the more cement

shall be used for which the Contractor will not get any extra payment. The proportion of all materials in the concrete shall be subjected to approval by the Owner/Engineer. The Contractor shall provide all plant and equipment necessary to determine and control the actual proportion of materials entering the batch.

a) In calculating the total water in any mix. The amount of water carried on the aggregate shall be included, the water on the aggregate shall be determined periodically by test and the amount of free water on the aggregate subtracted from the water added to the mix. In all cases the amount of water to be used shall be the minimum amount required to produce a plastic mixture of the strength specified and of the required density, uniformity and workability. The consistency of any mix shall be that required for the specific placing conditions and methods of placements.

b) Water used in mixing and curing concrete shall not more than 1,000 parts per million chlorides no more than 1,3000 parts per million sulfates, shall not have a turbidity count greater than 2,000 parts per million and shall also be free of objectionable quantities of oil and organic materials.

2.5.8 Storage of materials

Cement and aggregate shall be stored at the site of the work in such manner as to prevent deterioration or intrusion of foreign matter. Special care shall be taken in storing cement to keep it thoroughly dry at all times.

a) Cement that has become caked in storage is still usable only if, when pressed between the thumb and fingers, it powders readily. Otherwise, its use will not be permitted.

b) When reinforcing steel is delivered to the job in advance of the Contractor's requirements, the Contractor shall provide suitable protection in order to prevent excessive rust developing on the reinforcing steel. It will be Contractor's responsibility to remove excessive rust.

c) Before starting the foundation construction all screened aggregates and sand shall be collected and stockpiled near site. So that it is free from clay, dust and other foreign materials.

2.5.9 Concrete mixing

Before any concrete mixing is begun all equipment for mixing, transporting and placing the concrete shall be cleaned of all dirt and debris. All dirt and debris shall also be removed from the places to be occupied by the concrete.

a) All mechanical equipment shall be checked before starting a concrete placement to ascertain whether or not it is in good operation condition and not shall be tuned- up, repaired or replaced to the satisfaction of the Owner/Engineer.

b) When a foundation location is ready for concrete placement, the Contractor shall inform Owner/Engineer at least 24 hrs. before concrete placing time so that Owner/Engineer may inspect to assure that the excavation is free of water, mud and debris : then the bottom surface of the excavation is a well leveled and properly compacted crushed stone sub-base; that the reinforcing steel is properly secured in place; and that the form-work is properly braced.

- c) Rock surface shall be as flat as possible and projecting ridges shall be leveled off before the concrete is placed or space between the ridges shall have been filled with concrete to form a horizontal surface.
- d) The Contractor shall ensure that all materials that is to be embedded in the concrete has been placed before the concrete is places. The contractor shall be responsible for the accurate location of all embedded materials. Any work in accurately or improperly set shall be relocated and rest reset at the Contractor's expense.
- e) All batching components of the concrete shall be accurately measured. Measuring on a weight basis is preferred however measuring on a volume basis will be allowed as long as careful controls are maintained. Weight measurements shall be made using standards batching equipment for large quantities and wheelbarrow scales for small quantities. Volume measurements shall be made in batching boxes. The batching boxes shall be as large as is practical.
- f) The batch mixer shall be rotated at a speed recommended by the manufacturer and mixing shall be continued for at least one and one half (1-1/2) minutes after all materials are in the mixes, unless the size of the batch is over 1.2 cu. M. when additional mixing time shall be required as advised by the Owner/Engineer. A mechanically operated batch mixer shall be used for concrete mixing.
- g) The retempering of concrete, which has partially hardened, that ism remixing with or without additional cement, aggregate or water, will not be permitted.
- h) Concrete shall be conveyed from the mixer to the place of final deposit within 30 minutes by methods which will prevent the segregation or loss of the materials. After 30 minutes of mixing the mixed concrete shall be rejected and replaced by fresh concrete at contractors own expense.
- i) Equipments for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to insured a practically continuous flow of concrete at the delivery end without separation of the materials. The chutes shall never be on a slope that is steeper than two vertical to three horizontal. Conveying equipment shall not any aluminum parts the come in contact with the concrete.
- j) When the Concrete is to be placed on hard rock or other concrete, after the existing surface has been properly cleaned and otherwise prepared the existing surface is to be wetted until it is saturated. The first batch of concrete places shall be as required. The grout shall be evenly spread on the water-saturated surface and then normal concrete shall be deposited continuously and as rapidly as practicable.
- k) The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the spaces between the bars and so that each layer properly mixes with its predecessor. Successive layers shall be places within 15 minutes of the proceeding layer.
- l) When placing concrete with free drops over 2 meters, sufficient numbers of hoppers and trunk must be provided of a size to allow for proper placing. The trunk sections shall reach within 500mm of the bottom of the placement.
- m) The concrete shall be consolidated during and after depositing by vibration, the concrete shall be thoroughly worked around reinforcement and embedded items and into corners of forms.



- n) All concrete must be consolidated by means of internal vibration except where the Owner/Engineer has given written permission to use some other method of consolidation. The type and make of vibrator must have a speed of at least 6000 vibrations per minute (VPM) when the machine is being supplied, furnish efficient transformers, compressors, etc. of approved type to operate all vibrators at the voltage, pressure etc. specified by the manufacture.
- o) The Contractor shall always have at least two vibrators in operating condition at the location of the concrete placement.
- p) Vibrators shall not be used to transport concrete inside the forms.

2.5.10 The Contractors shall make at least one set of concrete compressive strength test cylinders each day or for each 100 cubic meters of concrete, or as directed by the Owner/Engineer. There shall be three cylinders to a set and the cylinders shall be made in accordance with ASTM C31. Only one cylinder shall be made from any batch containing less than ½ cubic meters of concrete.

- a) The Contractors shall delivery cylinders to a location designated by the Owner/Engineer where they will be tested in accordance with ASTM C39. Two of the cylinder will be tested at 28 days. If the 28-days test cylinder shall be discarded. If the 28 days tests indicated a compressive strength of less than 210 kg/sq.cm. the remaining cylinder will be tested at 90 days. The cost of the tests will be borne by the Contractor.
- b) If the 90 days compressive strength indicates a compressive strength of less than 210kg/sq.cm. the Owner/Engineer will determine what remedial measures are necessary and the Contractors shall perform the remedial measures at his own expenses. The remedial measurements may include, but are not limited to, the replacement of the entire foundation, The Contractor shall also pay for any additional concrete tests including core drilling and the repairs or replacements which may result from same, which the Owner/Engineer deems necessary strength.

2.5.11 Concrete formwork

Forms shall be used, wherever necessary to confine the concrete for structures and shape it to the required lines OR to insure contamination of the concrete by materials caving or sloughing from adjacent surfaces lest by excavation.

- a) Forms shall be provided with tie rods and clamps to have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall be maintained rigidly in position. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Molding strips shall be places in the corners of forms so as to produce chamfered edges on permanently exposed concrete surfaces. All exposed surfaces shall be formed with plywood or steel sheathing. Unexposed surfaces may be formed with any materials of adequate strength and tightness to hold the plastic concrete in proper position and prevent the loss of mortar.
- b) If plywood or steel forms are not available, the Contractor may substitute wood planking provided exposed surfaces are remove to remove ridges.
- c) Before concrete is places, the surfaces of all forms shall be coated with a form oil that

effectively prevents sticking and will not stain the concrete surfaces. For steel forms, form oil shall consist of refined mineral oil. For steel forms, form oil consist or refined mineral oil. For steel forms, from oil shall consist of refined mineral oil compound.

d) Forms shall be removed only after 48 hours of concreting or when the strength of the concrete is such that form removal will not result in cracking, spalling, or breaking of edges of surfaces, or other damage to the concrete. Any concrete damages by forms shall be repaired immediately.

2.5.12 Concrete finishing and curing

a) The expose top surface of all concrete foundation piers shall be wood floated and steel troweled and shall be slightly sloped to prevent the accumulation of water.

b) Immediately after the removal of forms, the holes left by form tie rod fastener shall be filled with mortar and all damaged or defective concrete shall be repaired or removed and replaced to the satisfaction of the Owner/Engineer. Improperly consolidated concrete shall be removed by chipping and the clipped openings or recesses shall be of such depth and shape are required to insure that the patching materials placed in the openings or recesses will be thoroughly keyed and bonded to the concrete. "dry pack" mortar shall be used for filling relatively deep chipped recesses with small surface dimensions. Concrete will be required for the replacement of defective concrete where surface dimension of the shipped openings or recesses are relatively large. The depth of chipped recesses for concrete patches shall extend at least 25 mm beyond the nearest reinforcing steel.

c) To insure proper curing, all concrete shall be kept moist for a period of least ten (10) days. Burlap or/and equivalent materials or a curing compound shall be applied over exposed concrete surfaces, the burlap shall be kept moist at all times.

2.5.13 Membrane curing compound

Membrane curing compound shall be applied uniformly by spray, leaving no pinholes or gaps, at a rate not to exceed 4.91 square meters per liter. The curing compound shall be applied after finishing operations are completed and surface moisture has disappeared. If forms are removed prior to 7 days placing the concrete, the uncovered surfaces shall be coated with the curing compound as specified herein.

a) Foundations shall not be backfilled before they have been inspected by Owner/Engineer to see that they are free from surface defects and voids, or that the defects and voids have been properly repaired,

b) The foundations shall not be subjected to any loads in addition to those existing at the time of placing of the foundation concrete until the curing period has elapsed.

2.5.14 Payment

No separate or direct payment will be made to the Contractor for concrete. All costs incurred in connection therewith shall be included in the lump sum bid price for the construction of the various foundation types and trenches.

2.5.15 Torsteel reinforcing bar

All torsteel reinforcing bar shall conform to the requirement of BS 1144 or equivalent and shall be fabricated in accordance with the "Manual of Standard Practice" of the concrete Reinforcing Steel Institute.

- a) Mill scale rust, oil and mud shall be removed from reinforcing steel by firm rubbing with burlap or equivalent treatment before the reinforcing steel is placed.
- b) The minimum center-to-center distance between parallel bars shall be two and one-half (2-1/2) times the diameter of the bars. In no case shall the clear spacing between bars be less than 25 mm not less than one-third (1-1/3) times the nominal maximum size of coarse aggregate.
- c) All reinforcing steel shall have a protective concrete cover of not less than:
 - 1) 80mm - on the bottom of footing and on any surface of concrete that will be exposed to salt water.
 - 2) 50mm - concrete exposed to weather or ground
- d) Reinforcing steel shall be accurately located and shall be secured in position by the use of annealed iron, no less than No. 16 gauge and shall be supported in a manner that will keep the reinforcement away from the exposed concrete surfaces. Concrete blocks shall be used to support the reinforcing steel in the foundation mat: broken stones or wooden blocks shall not be used to support the reinforcing steel.

No separate or direct payment will be made to the Contractor for concrete Reinforcement Steel. All costs incurred in connection therewith shall be included in the lump sum bid price for the construction of the various foundation types.

2.5.16 Grouting

Grouting for seating structural steel members and equipment on foundations shall be non-shrink (not-setting) Portland cement mortar grout or a suitable commercially available grout, at the Contractor's option. Grouting shall be done under pressure by means of an expanding agent or by means of static head. Positioning and mixing of grout shall conform to the following:

- a) Mortar grout containing aluminum powder as an expansive agent mixture of 1 part cement and 2 parts sand, by weight, with a water cement ratio not exceeding 0.55, the quantity of aluminum powder used shall be approximately 0.005 percent of the weight of cement, the actual quantity to be determined from tests with

materials to be used, and at the temperature and under the conditions of a placement. Aluminum powder shall be blended with cement in proportions of one part powder 10-50 parts cement, by weight and the blend shall be sprinkled over the dry batch. After all ingredients are added, the batch shall be missed 3 minutes. Grout, which has not been placed within 45 minutes, shall be wasted.

b) In lieu of use of an expensive agent. Settlement shall be reduced by extending the missing period or by delaying final mixture to minimize the interval between time to placement and initial set and placement the under static header pressure. The motor grout shall be mixture of one part cement and 2.5 parts sand, with a water cement ratio of approximately 0.50, slump shall be the minimum necessary to enable placement.

No separate or direct payment will be made to the Contractor for Grouting. All costs incurred in connection therewith shall be included in the lump sum bid price for the construction of the various foundation types.

2.5.17 Payment

Payment for the contract item, Concrete foundation, will be made at the unit price per foundation type bid in the Schedule, which unit price shall include full compensation for all costs incurred in furnishing all materials, equipment and labor and all costs incurred in furnishing all materials, equipment and labor and all other operations related to concrete Foundation design and construction, including but not limited to:

- a) Performing detail foundation design and preparation of construction drawings including bar-bending schedule.
- b) Supplying and transporting
- c) Excavation, dewatering, providing 10cm thick soiling layer as under Article 2.4.6 of this section, providing 5cm thick (1:3:6) lean concrete layer and back filling for the foundations.
- d) Constructing the foundation including form work setting, reinforcement bar cutting bending and fixing.
- e) Grouting for base plates
- f) Concrete testing

3. BUILDING WORKS

3.1 General

This specification is intended to cover the complete provision and erection of control building and furnishing if the indoor facilities for the project including all design, supervision, materials, equipment, labor and services necessary for or incidental to the construction of control building.

3.2 Scope of work

3.2.1 The Contractor shall perform the design, construction works, furnishing and delivering of the equipment, materials and all accessories for the control building as listed below:

- a) Excavation and Backfilling
- b) Concrete Work
- c) Flooring
- d) Stone Masonry work
- e) Plaster and Punning Work
- f) Glass and Glazing
- g) Doors and Windows with iron grills
- h) Water Proofing
- i) Painting
- j) Plumbing, Drainage and Sanitary fitting
- k) Cable Trench
- l) Ventilation and Fan
- m) Fire fighting
- n) Heat Insulation

3.2.2 All the works for the control building shall be subject to approval of Owner/Engineer. Owner /Engineer shall have the right to required the Contractor to make any changes on designs, construction works, materials and equipment to make the structures conform to the specification without and additional cost.

3.2.3 The Contractor shall prepare the design drawings including all facilities based on the attached conceptual drawings and submit the design drawings to Owner/Engineer for approval.

3.2.4 Bearing Loads

The Contractor shall use an allowable soil bearing pressure of 1.0kg/cm² for the design of foundation for bidding purpose. But this is only reference value. After award of contract, the Contractor shall carry out detailed soil test and detailed design of foundation shall be based on the soil test result. There may be variation in the volume of work in final design compared to the bidding for which the contractor will not get any extra payment.

3.2.5 The design live load for all floor slab not be less than 600/kg/m² and 100kg/m² for roof slab.

3.3 Codes and standards

The latest editions of Codes, Specification and Standards listed below, but referred to thereafter by basis designation only from a part of this Specification to the extent indicated by the references thereof.

In the event of conflicts or discrepancies between this specification and the referenced codes, Specification or Standards, the more stringent applicable requirement shall govern.

- a) American National Standard Institute (ANSI) Standards
- b) American Society for Testing and Materials (ASTM) Standards
- c) American Concrete Institute
- d) Concrete Reinforcing Steel Institute
- e) National Fire Protection Association (NFPA) Publications
- f) Federal Specification
- g) Flat Glass Marketing Association (FGMA) Publication

It is the intent of this specification to establish acceptable standards or quality and performance. Minor deviations in details due to manufacturer's standards shop process will be considered for acceptance provided that, in the opinion of the Owner/Engineer, the proposed substitutions are equal in quality and performance to the specified materials. All deviations shall be called out in writing in the proposal and shall be specially indicated on the shop drawings. The Contractor will not get any extra payment for increase/decrease of work volume due to such deviations.

3.4 Excavation and Backfilling

The detail Specification for the excavation and backfilling work shall be as per Article 2.4 of Section VI.

3.5 Concrete Work

The detail Specification for the concrete work shall be as per Article 2.5 of Section VI.

Concreting in control building shall be done in foundation, tie beams, floor slab, steps, column, beam and roof slab as per approved drawings.

3.6 Flooring

3.6.1 Scope of Work

Perform all flooring work required as per drawings and as specified herein.

3.6.2 Reference

All work and materials shall be in accordance with American Standards, ASTM, or equivalent.

3.6.3 Materials

a) Sand shall be coarse, clean sharp sand, free from clay, loan or other impurities. Sand shall be uniformly graded from coarse to fine and shall conform ASTM or equivalent.

b) Portland Cement

Portland cement shall be as per STM (150 TYPE) or equivalent. Only one brand of cement shall be used in the work.

c) Gravel

Gravel shall be well graded hard, fresh and conform to ASTM or equivalent. d) Water

Water shall be clean fresh and free from injurious amount of oils, acids, alkalies and organic matter.

3.6.4 Construction

a) Preparation of earth

The earth is properly rammed and leveled by rammer, before gravel soiling water is sprinkled during ramming

b) Gravel Soiling

Above the rammed earth well graded gravel is layed and coarse sand is spreaded over the gravel bed. Water is sprinkled and compaction is done properly. The top surface is properly leveled and compacted before concrete laying.

c) Concrete laying

Concrete work shall be one as specified under article 2.6 in Section VII. The flooring shall consist of (for each square meter)

- Concrete mix: 300kg/m³ thickness 0.15m with 2% water proofing compound.
- Steel bar 8kg
- Graveled layer 0.1 thick

3.6.5 Tiles

Terrazo tiles shall be installed in control room, 11kV switchgear room, toilet and battery room. Terrazo tiles shall be precast tiles with an average weight of 5.6 kg. The tiles shall be 30 cm x 30 cm and wall base units of grade 1 according to American Standard or equivalent.

High-density ceramic tiles shall be placed on the walls of battery room and bathroom upto a height of 1.75 m from the floor.

3.7 Stone Masonry Work

3.7.1 Materials

- a) Stone units shall be sound, free from defects that would impair its strength or affects its service ability.
- b) Cement shall be ordinary Portland as per ASTM C150 Type 1 or equivalent.
- c) Sand shall be clean, fine, sharp granules, free from foreign or deleterious matter.
- d) Water shall be clean and free from acid, alkalis, oil or organic matter.

The Contractor should submit samples of cement sand and lime for Owner/Engineers approval.

3.7.2 Mortar Mixture

The type of mortar mixture for stone masonry shall be 1 part, P.C : 5 part sand

3.7.3 Stone masonry laying

- a) Lay stone masonry in accurately spaced courses, level, plumb and true to line.
- b) Soak stone units in clean water for one hour before laying. Units shall be damped when laid.
- c) Lay stone in running bond with joints approximately 10mm wide.
- d) When stone masonry wall cross the recessed floor cable trenches provide and install cast-in-situ concrete Lintels of sufficient size and strength to support and carry masonry walls across the trench sprays.

e) Reinforced all masonry walls with cast-in-situ reinforced concrete formed flush with the masonry surfaces for cement plaster-finish.

f) Provide concrete pilasters and horizontal tie for every 9 square meters of masonry wall surface, plus at all corners and door jambs.

g) Size of wall

1) All the peripheric wall shall be constructed in 360 mm thickness.

2) All the partition wall shall be constructed in 240mm and 110mm thickness. But the latter one shall be constructed at less than 3.0m span only.

3.7.4 Curing

Spray masonry surfaces with water twice daily for a period 10 days, or until the surface receives a plaster finish.

3.7.5 Protection

Where exposed to weather, protect top of masonry with water tied materials in such a way that it will protect the completed work. Masonry wall shall set for 48 hours before any load is applied on the completed work.

3.8 Plaster and Punning Work

Plaster

3.8.1.1 Materials

Shall conform to the respective Specifications and other requirements specified below:

a) Sand:

Sand shall be coarse, clean sharp sand, free from clay, loam or other impurities. Sand shall be uniformly graded from coarse to fine.

b) Protland Cement

Portland cement shall be as per ASTM C 150 Type 1 or equivalent. Only one brand of cement shall be used in the work.

c) Water shall be clean, fresh and free from injurious amount of oils, acids, alkalies and organic matter.

3.8.1.2 Construction

a) Thickness of plaster

Thickness of plaster from the face of the plaster base to the finish plaster surface shall be 2.0 cm.

b) Preparation of plastering

Concrete surfaces shall be thoroughly cleaned and free of paint, efflorescence, oil, grease, acids, and other loose or foreign matter prior to application of base coats.

No plaster work shall be applied on masonry work less than 2 weeks old. c)

Mixing of plaster

Plaster shall be mixed in mechanical mixers where hand mixing is approved for small quantities. Caked or lumpy materials shall not be used. Each batch shall be proportioned by volume, accurately measured by manual or mechanical devices, and thoroughly mixed with the minimum amount of water unit uniform in color and consistency. Retermpering will not be permitted and plaster that has begun to stiffen shall be discarded. Mortar 90 minutes after mixing shall be rejected for the plastering work.

d) Proportions

These are differentiated into 2 TYPES:

1) 1PC: 3 SAND

2) 1 PC: 4 Sand

Type (1) is to be used on all external walls, ceiling and floors. Type (2) is to be used everywhere else.

All concrete works and inside and outside walls shall be plastered. e)

Plastering

Plaster shall be done in two coating, both shall be proportioned as mentioned in (Article D) above but sand to be used in the finish coating shall be of the finest grade.

The first coating shall be applied with a spatter-dash, which is to be done by forcibly throwing the wet mix on the surface and making no attempt to level it.

The second coating will be applied after the first coating has hardened. After this, a wet soaked sponge shall be rubbed on the finish surface.

3.9 Door and Window

3.9.1 The contractor shall furnished and install doors and windows. The Contractor shall prepare and submit drawings of doors and windows to Owner/Engineer for approval, prior to the execution of the erection work floor level.

Wooden doors and Windows

Timber shall be the sal wood. The timber shall be of the best quantity well seasoned and free from sap, knots, wraps, cracks and other defects. All wood work shall be planes and neatly and truly finished to the exact dimensions. All joints shall be neat and strong truly and accurately fitted and glued before being fitted together.

3.9.2 Carpentry

3.9.2.1 Materials

Lumber shall be subjected to Owner's/Engineer's approval

a) Salwood

1) Sized and Pattern

Lumber shall be surfaced four sides, and worked according to patterns as are indicated or specified on the drawings. Expose members for transparent finish shall be attached for compatibility of grain and color between adjoining members; for paint finish, is not required. The size of frame of panel shall not be less than 40mm x 100mm and the size of frame of shall not be less than 75mm x 120 mm unless mentioned specifically otherwise.

2) Moisture Content

At the time of delivery, the moisture content shall not be exceed 15% for material of 2.5 cm or less in thickness, and shall not exceed 19% for material over 2.5 cm in thickness.

b) Teak Plywood

All interior plywood for transparent finish shall be of equal and uniform of color and graining, such as for door panels. Hardwood plywood shall be of premium grade. Plywood for paint finish matching for compatibility is not required

c) Veneers

Veneers on wood doors, panels and other exposed wood work shall be 4 mm thick.

d) Fasteners

Only galvanized fasteners will be used. e) Glue

Fully waterproof throughout, such as “herein” or equal.

f) Putty

Shall conform to American Standards or equivalent.

3.9.2.2 Construction

a) Fastening for exposed members

Other than two positioning nails per sub-assembly of plywood no exposed nails shall be used. All exposed members are to glued using either pressure of electric wood welder. All traces of access glue shall be removed. Top shall be fastened to sub-or web frames with concealed clips, screws, glue blocks or similar bidden fastenings. Exposed ends shall be lock mitered and glued to face plates.

b) Edge Treatment

Visible edge shall be banded with lumber edging, glued under [pressure with no nails allowed. Species shall match the face veneers of plywood, but may be of any species on particleboard.

c) Size of door

Unless and otherwise specified, the size of door panel shall not be less than 1.0 x 2.30m (w x h).

3.9.2.3 Hardware

Hardware's such as hinges, cylinder locks, handles and door closers shall be stainless steel of excellent quality. Samples of hardware's shall be submitted to Owner/Engineer for approval. Cylinder locks and door closers shall be installed with the doors and windows according to the instructions of Owner/Engineer. Master key for all locks shall be provided.

3.9.3 Aluminum Windows Frame and Shutters

(1) Material

These shall be fabricated from 15 micron natural or color anodized Aluminum profiles conforming to IS: 733-1983.

The glazing glass shall be clear IAG float glass or equivalent without any distortion.

The window shall be made out of extruded aluminum section (Al. Mg. Si.) and shall conform to IS – 63400, AA-6063 unless otherwise directed. Aluminum sections shall be anodized and the anodic film shall be 12-15 microns. The colors shall be as directed. The 2-3 tracks on outer frame of standard size otherwise directed shall be fixed in the position by using heavy duty plastic grips with necessary plugs and fillers. All the sliding shutters shall be provided with two ball bearing rollers and ratting pieces/guides one each at the top and bottom, weather strips all around. Openable window shall be double weather stripped, one strip shall be provided in outer frame and outer shall be in the shutter frame. The hinges or stay hinges of openable window shall be strong. Pin of the hinges shall be of non-corroding materials, preferably nylon/steel. All the joints shall be mechanically fixed. All the window shutter shall be provided with special locking arrangement. Glass shall be fixed in the shutter by means of rubber gaskets.

(2) Construction Procedures

The sliding window frames are of two-track design and the shutters are to be jointed by special cleats for extra strength. Rollers mounted on ball bearings are to be fitted to obtain smooth operation. The sliding shutters shall have provisions for grooves for weather strips to exclude wind, water or dust ingress. The shutters are glazed with 4mm thick approved quality and clear transparent glass using gaskets of ethylene-propylene or PVC (EPDM/ PVC). The doorframe shall be made of aluminum extrusion as per design. The ventilator frames with fixed glass shall be of same dimension as the sliding two-track frame. The frames and shutters are to be fabricated by using the crimping method of corner jointing. Corners of frames are to be miter cut on high speed TCT saw machines to give burr free corners. Sturdy corner cleats should hold the frames with only a hairline corner joint visible and the frames should be square/ rectangular and free from distortions. The frames shall be firmly secured to the walls in line and level. Only aluminum screws shall be used for joining and no welding will be allowed. The joint between the frame and the plaster on walls, sill and lintel beam shall be filled with silicon sealant. The aluminum windows/ ventilators/ doors shall be free from scratches and other visible defects.

The frames are fixed to the wall with plastic grips and steel screws of suitable color.

(3) Measurement

Measurement of works will be made in m² of works as specified.

(4) Payment

Payment for work will be made on the basis of contract unit price indicated in the BOQ.

The payment will be full and final compensation for all material, labor, and equipment to complete the works as specified.

3.9.4 Mild Steel Folded Door and Windows Frame and Shutters

(1) Materials

Specifications and Codes: All work shall conform to relevant Indian/ British or American Standard specifications and codes of practice for materials, methods and practices.

1. All metals shall be free from defects impairing strength durability or appearance and

shall be of best commercial quality for each intended purpose.

2. Fastenings, which are exposed, shall be of the same materials, color and finish the metal to which they are applied, unless otherwise shown on the Drawings, or specified. All items employed with galvanized iron and steel shall be galvanized ferrous metal.
3. Steel: Mild steel shall comply with B.S. 15, where a guaranteed yield stress is required and shall comply with B.S. 3706 Grade –I for other general uses where a guaranteed yield stress is not required that rolled sections shall comply with B.S. or Mild rolled steel sections/ frames for windows, doors etc. shall be as B.S. 990: Pt2: 1972 or B.S.1787, 1951 or IS 2062-1962. Pressed steel sections & frames for windows, doors & ventilators shall comply with IS 4351 1976.
4. Sheet Steel: Shall conform to the requirement of British Standard Specifications.
5. Filter Metal for Welding: Welding electrodes for manual shielded metal arc welding shall conform to British Standard Specification.
6. Details and Specification: of accessory items for which standard products are available are representative guides to requirements for such items Standard products generally meeting such equipments will be accepted, if details of construction and installation are approved of the consultant.

Painting and Protection:

1. All ferrous metal surfaces, except pre-finished galvanized items and those obviously not to be painted, shall before leaving the shop or manufacturing plant, be cleaned of all scale, rust, grease and other foreign matter and shall be given one (1) thorough step coat on all surfaces, of an approved primer of red lead until and unless changed, ready and compatible for finish painting at the building site under painting Section. Primer shall be compatible with materials to be used infield painting and shall be used directly from factory-labeled containers. Touch-up damaged and abraded spots after installation using same paint. Steel fully embedded in concrete shall be left unpainted.

Workmanship

1. All work shall be executed by experienced mechanics and shall conform to details, be clean and straight with sharply defined profiles. Unless otherwise particularly noted, finished surfaces shall have smooth finish.
2. Curved work shall be formed to true radius and punching shall be done cleanly so as not to deform or mar adjacent surfaces.
3. Shop connections shall be welded or riveted and field connections bolted unless otherwise indicated. Use flat-head counter-sunk rivets finished flush where riveted connections are exposed to view in finished work. Bolts shall be turned up tight and threads deformed to prevent loosening.
4. Castings shall be sound and free from warp, holes and other defects that impair strength and appearance. Exposed surfaces shall have a smooth finish with sharp well-defined lines and arises. Machined joints shall be milled to a close fit. Provide all necessary logs, brackets and similar items so that work can be assembled and installed in a neat, substantial manner.
5. Flanges shall be concealed where pre thickness of metal/ metal sheets and sheets and details of assembly and support shall be such as to provide sample strength and stiffness.
6. Provide holes and connections as required to accommodate the work of other trades and for site assembly of metal work. Holes shall be drilled or punched and reamed in the shop.
7. Joints and connections exposed to weather shall be formed to exclude water.
8. All materials and workmanship under this section shall be subject to inspection in the mill, shop and field by the consultants.

(2) Construction Procedures

Doors, windows, ventilators and other frames required for fixing glazing/ shutter shall be out of high strength aluminum or steel as described above. All samples are to be approved by the consultant prior to fixing, and the units shall not be forced into opening which are out of square or too small. The doors, windows and ventilators shall be secured at head jamb and sill, and care shall be taken that the units are not distorted when screwing up to lugs and fixing screws. Frames shall be grouted with cement mortar into the prepared openings and joints and the frames shall be caulked with mastic cement/ synthetic resin obtained from the window manufacturers, or as approved and specified. Metal doors, windows and ventilators shall be provided with one shop coat of rust inhibitive paint and three coats of enamel or aluminum paint upon installation. Metal windows shall be installed in masonry or concrete with steel holdfasts in an approved manner and shall be installed in plumb line & level.

- i. Each window shall be complete including anchors, clips, bolts, mullions, hardware and attachments required.
- ii. Drips and weep holes shall be provided.
- iii. Mullion covers shall be provided for mullion.
- iv. Openable sections of windows shall be watertight and water stripped.
- v. All glazed panels shall be provided with glazing arrangements with clips, beads or other approved method. Glass shall be as per specification and conform to IS: 2835-1977. Putty for fixing shall not be less than 185gms per meter of glass per meter.

Steel Door and Windows Frames shall be made from M.S. Steel sheet of 18G and shutter from 20G M.S. Steel sheet folded to the shape as shown in drawing. The bending joints are welded smoothly and grinded to form the same surface as the section and shall be in perfect line and level. Doors and Windows shall not be forced into openings, which are out of square or too small. The doors and windows shall be secured by three holdfast in each side if required on the top and bottom, and care shall be taken that doors and windows shall not be distorted when screwing up to lugs and fixing screws. Doors and Windows shall be grouted in M15 Concrete at hold fast point into the prepared openings and joints between building openings.

For each doorframe, sal wood timber of 250mm*internal section shape shall be fixed at each hinge location.

Welded joints shall be free from slag, neatly made, filed and grinded smooth and left clean and adequate means shall be employed for temporarily fastening the parts to be welded together until the joints are welded. All welding scrape shall be removed before painting primer.

The Engineer In-charge shall of Indian manufacture and best quality mild steel or wrought iron of lengths and weights approve nails, Spikes and Bolts.

Nails shall comply with the relevant British or Indian standard specification.

Building in unless otherwise described, all items of metal work shall include for “building in” to concrete or walling etc. and for “making good” finishing thereto.

(3) Testing

The Engineer In-charge shall be at liberty at all reasonable times to enter the site of the works, or any other premises in which the work is being prepared for the purpose of inspection. Any work

found defective or which is not in accordance with the drawings or the specification, engineer in charge shall reject and such defective work shall be at once make good at the contractor's expenses.

(4) Measurement

Measurement of works will be made in m² of works as specified.

(5) Payment

Payment for work will be made on the basis of contract unit price indicated in the BOQ.

The payment will be full and final compensation for all material, labor, and equipment to complete the works as specified

3.9.5 Mild Steel Grill

(1) Material

The Mild steel grills are fabricated from the Mild Steel flat, angle and channels conforming to the BS 15 or equivalent. The welding shall be butt-welding conforming to sub clause 170.1

The grips are of plastic or metal. The screws shall be steel screws.

(2) Construction Procedures

The mild steel grill shall be made according to pattern given as per drawing. Welded joints shall be neatly made, filled smooth and left clean, the consultant is to be informed when the welded work is ready for inspection and any such work must be left unprimed until the consultants gives his approval. The contractor shall furnish at his own expenses all necessary tools and all materials, which he may require for the safe erection of the work and remove the same when the work is completed. The contractor shall be solely responsible for any damage doe to the structure during erection and any member, which has been bent or otherwise distorted either before or during erection, shall be straightened or replaced in an approved manner at his own expenses. The grillwork shall be finished with two coats of red lead followed by three coats of aluminum or enamel paint and fixed in the opening, as per instructions of the consultants.

The grills are fixed to window opening by plastic grips with steel screws firmly to the faces of opening.

(3) Testing and Inspection

The erected fencing shall deform any post and wires shall be straight with out sagging.

(4) Measurement

The above work shall be measured in m² of opening in vertical plan completed as specified.

(5) Payment

Payment for the work will be made on the basis of contract unit price indicated in the BOQ.

The payment will be full and final compensation for all material, labor, and equipment to complete the works as specified.

3.9.6 Mild steel Main Gate

The Mild steel gates are fabricated from the Mild Steel flat, angle and channels conforming to the BS 15 or equivalent. The welding shall be butt-welding conforming relevant clause of this specification

The grips are of plastic or metal. The screws shall be steel screws. The gate shall of steel sheet conforming to BS 15 or equivalent of 20G.

The gate is primed with two coats of red lead primer.

The gate is painted with two coat of enamel of bituminous aluminum paint to get uniform painted surfaces.

(1) Measurement

The above work shall be measured in m² of opening in vertical plan completed as specified.

(2) Payment

Payment for the work will be made on the basis of contract unit price indicated in the BOQ.

The payment will be full and final compensation for all material, labor, and equipment to complete the works as specified.

3.10 Water Proofing

This section covers all the construction work for disposing the rain water from the roof. To dispose rain water from roof there will be 10cm average thickness of 1:2:5 concrete for the slope of roof. A layer of tarfelt shall be provided as vapor barrier course between RCC slab and slop concrete. At top of slope concrete (After hear insulation layer) the waterproofing layer shall be self-adhesive bitumen/polyethylene (tarfelt) membrane of thickness about 1.5-2.0 mm capable of bridging any shrinkage cracks in concrete.

The area to be applied must be dry and swept free from dust.

Prime all surfaces with primer and apply the membrane when the primer is tacky. All lap joints must have an overlap of 75mm rolled firmly against each other. The membrane has to turn up to the roof parapet, counter flashed by a metal sheet all in accordance to drawings and manufactures instructions.

The type and made of the membrane must first be submitted for approval by the Owner/Engineer.

- a) A layer of 30mm round stone chipping of 2-5 mm size shall be provided with bituminous bonding, to achieve water proofing.
- b) 100mm dia. G.I rain water down spout pipe shall be installed at least 4 corners of roof and it shall be connected to the manhole (40 x 40 x 60 cm) at bottom, from each of the manhole 100 mm. of polyethylene pipe shall be used to connect to the switchyard drainage line.

3.11 Heat Insulation

The section covers the treatment of heat insulation at roof.

Heat insulation layer shall be 33 mm thick expanded polystyrene sheets which shall be installed above slop concrete layer with hot bitumen setting bed.

3.12 Plumbing, Drainage and Sanitary Fittings

3.12.1 General

The Contractors shall furnish, install and test the complete indoor Potable Water service Water , Plumbing, Storm Drainage and Sanitary Sewer Systems. The pipe line outside the Owner's premises shall be the responsibility of the Owner.

All necessary incidentals such as sanitary fittings, wash bowl water closet, equipment supports, flushing system, excavation and backfill, the Contractor shall supply disposal of surplus dirt and rubbish.

The Contractor shall furnish satisfactory functioning installations. All items of labor, material or equipment not pacifically mentioned herein, but incidental to required for a complete installation and proper operation of the above mentioned systems, shall be included.

The Contractor shall furnish and install 1.0 cubic meter capacity PVC water tank on roof and suitable pump to pump the water from an under ground water storage tank comprising of a similar 2 cu.m PVC tank to be installed underground by the Contractor.

3.12.2 Standards

The work shall be carried out in accordance with Codes National Plumbing code. S. U. Department of commerce, unless otherwise indicated.

3.12.3 Workmanship

The installation shall be made in neat, orderly and workmanship manner, conforming in every way to the accepted standards of the best commercial practice.

3.12.4 Design Requirements

The plumbing and drainage of all the buildings shall be as per the National Standard Plumbing code.

For the potable and service water supply to the building and over storage tank of 1 cubic m storage capacity will have to be provided by the Contractor. The tank will be mounted on the roof. The water distribution inside the building will be taken from this overhead tank.

The design of the plumbing system shall be developed by the Contractor. Floor drains, drain from washbasin and drain from the equipment shall be run separately from sanitary sewer and connected to the outdoor switchyard water drainage system.

Sanitary sewer drain from the building will be connected to the septic tank (1.0m x 2.5m x 1.5m) and out let from septic tank connected to the soak pit (1.0 m dia. And 3.0m deep). Overflow from the soak pit shall be connected to the switchyard drainage system.

- a) Septic tank shall be constructed in double compartment in 240 mm thick stone masonry wall with 1:4 cement concrete 1:2:4 in 20mm thickness. The septic tank shall be provided with removable RCC slab cover.
- b) Soak pit shall be constructed in honey-combed stone wall of 240 mm thick with 1:4 cement sand mortar.
- c) Sewage pipe shall be heavy quality cast iron and not less than 100 mm dia. In size.
- d) Drain pipe to connect drainage system from soak pit shall be used of 100mm dia. Of polyethylene pipe of heavy quality.
- e) All the water supply pipe shall be heavy quality of galvanized steel pipe required size.

3.13 Cable Trench

3.13.1 The details design of the cable trench shall be responsibility of the Contractor. All designs and details shall be subjected to approval of the Owner/Engineer.

3.13.2 Type of Cable Trench

3.13.3 Type of cable trench

Cable trench shall be reinforced concrete trench with one or more layer of hot dip galvanized light gauge shape steel tray. The cover of trench shall be min. 6mm thick checkered plate with steel frame and shall be galvanized.

3.14 Paint

3.14.1 General

All surfaces shall be painted except the following:

- a) Exterior

Roofing, paving, concrete, nonferrous metals, glass, pre –finished items. b)

Interior:

Glass, ore-finished surface, nonferrous metals, stainless steel, attic surfaces.

3.14.2 Materials

A list of the painting materials and their color which are to applied the specified surfaces shall be submitted to the Owner/Engineer for approval.

3.14.3 Paint Application

The finished surface shall be free from runs, drops, ridges, waves, pales, brush marks, and variations in color, texture and finish. The hiding shall be complete and coat shall be so applied as to produce film of uniform thickness. Special attention shall be given to insure that all surfaces including edges, corners, crevices, wells and rivets receive a film thickness equivalent to that of adjacent painted surfaces.

Adjacent areas and installations shall be protected by the use of drops cloths or other approved precautionary measures.

Metal or wood surface adjacent to surface to receive water-thinned paints shall be primed and/or touched up prior to the application of water-thinned paints. The first coat on plaster shall include such repeated touching up of suction spots or overall applications of primer sealer as necessary to produce a uniform color and gloss. The first coat on both faces of wood doors shall be applied at essentially the same time.

- a) Coating Progress

Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit adverse weather conditions.

Oil base or olcoresinous solvent type paints shall be considered dry for recoating when the paints feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

Coating shall be as follows:

- 1) All interior and exterior plastered surfaces:

- First coat: 1 coat of Alkali Resistance Primer

- Second Coat: 2 coat of weather shield Exterior wall finish in water [roof snowcem paint.

2) Gloss finish work:

- First Coat: 1 coat of Wood Primer
- Second coat: 2 coat of synthetic super gloss

3) Interior transparent finish wood:

- First Coat: 1 coat of Wood Primer
- Second coat: 2 coat of Teal oil.

4) Metal surface:

- First Coat: 1 coat of Metal Primer Chromate
- Second coat: 2 coats of Aluminum Paint

b) Storage, mining and thinning

At time of application, paint shall show no signs of hard setting, excessive skinning, leveraging or other deterioration. Paint shall be thoroughly stirred, strained and kept at a uniform consistency during applications.

Where necessary to suit conditions of surface, temperature weather, and method of application, package pint may be thinned immediately prior to application in accordance with the manufacture's directions, but not excess of 0.5 liter of suitable thinner per 4 liter. The use of thinner for any reason shall not relieve Contractor from obtaining complete hiding.

Samples shall be clearly identified by designated name, specification number batch number, project contract number, intended use, and quantity involved. At the discretion of the Owner/Engineer samples may be tested before approval, or materials may be approved for use based on the test reports furnished. In the later case the samples will be retained by the Owner/Engineer for possible future testing should the materials appear to be defective during or after application.

3.15 Glass and Glazing

a) Sheet glass to be used for door and windows shall be 6 mm thick, tinted glass except as otherwise specified. It shall be of the best quality, free of unevenness, stain or bubbles, and materials appear to be defective during or after application.

b) Glazing compounds shall be of suitable type approved for the application.

The use of no-skimming compounds, non-resilient type of performed sealers, and performed impregnated type gasket will not be permitted. Metals sash putty will not be permitted.

c) Channel glazing compound shall be equal in performance to, but not limited to the following.

1) Non-drying, knife grade polybutene sealant. d)

One-part acrylic terpolymer sealant.

e) Shop painted items

Surfaces of fabricated and assembled items that are finish painted by the manufacture or specified to finish painted under other sections of the Specification are exempted from the following schedule requirements for surface preparation and painting shop primed items shall receive surface preparation and finish painting as required by the section.

f) Colors and tints, including shades of stain, shall match the respective color specimens selected by the Owner/Engineer.

Stains shall conform in shade to manufactures standard color. Undercoat shall vary slightly from the color of the next coat.

g) Surface preparation and pretreatment

Cleaning and pretreatment of surface prior to painting shall be accomplished in accordance with the detailed requirements specified.

h) Cleaning

Clots and cotton waste that might constitute of fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, staging, scaffolding and containers shall be removed from the site or destroyed in as approved manner.

3.16 Ventilation and Fans

Rooms shall be provided with ceiling fans and suitable exhaust fans shall be installed in the battery room and toilet.

3.17 Fire Fighting System

3.17.1 The Contractor shall supply and install all fire fighting system for control building and switchyard.

3.17.2 The contractor shall supply two sets of portable type of 10 lb CO₂ fire extinguishers for control rooms/switchgear room and one (1) set of wheeled cart type shall be

provided with the fire extinguisher. The extinguisher shall be especially suitable to rooms with electrical equipment.

3.18 Electrification work

3.18.1 Supply and fixing of all electrical work shall be performed in accordance to the Clause-13 Lighting System in Vol-II –Section I Specification of Electrical Equipment.

3.18.2 Payment

Payment for the contract item: Electrification work will be made at the lump sum price bid. Therefore, in the schedule, the price shall include compensation for all costs incurred in furnishing all materials and labor and other operations related to electrification work.

3.19 Supply and installation of furniture and indoor facilities

3.19.2 Furniture and indoor facilities as listed below shall be supplied under the item “Supply and installation of furniture and indoor facilities as per specification”. Payment for this item shall be in lump sum basis (in lot).

3.20 Payment

The payment to the Control Building shall be made per unit basis as per the Price Schedule.

TRAINING, INSPECTION, TESTING AND COMMISSIONING

1.1 SCOPE OF WORK

The whole of the Works supplied under the Contract shall be subject to inspections and tests by the Employer or their Representatives during manufacture, erection and after completion. The inspections and tests shall include, but not be limited to, the requirements of this section of the Specifications.

The Contractor shall provide all costs, appliances, apparatus, supervision, labor and services necessary to carry out all tests, unless specifically stated otherwise.

The Contractor shall furnish the detailed schedule of his commissioning plan at least one month prior to the scheduled date. The schedule shall include the commissioning procedures, testing sequences and details of special testing equipment, tests and commissioning record formats, information about relevant standards etc.

The scope of the commissioning program includes the site testing and putting into successful operation of all the equipment supplied under the Contract, for 33kV, 11kV, AC & DC plants and all secondary voltages systems. Testing of energy meters and certification of their accuracy shall also be included.

1.2 OBJECTIVES

The objectives of commissioning work, prior to the successful energization of Plant at full voltage and connection to the system, are the following:

- Confirm the integrity (correctness) of installation.
- Confirm the integrity of insulation, connections and phasing.
- Ensure proof of equipment characteristics.
- Review workmanship.
- Confirm the correct implementation of the design.
- Check equipment ratings.
- Check settings and operation of protective relays.
- Check and measure resistivity of earthing grid and earthing system.
- Confirm the proper functioning of SCADA system.

1.3 QUALITY ASSURANCE, INSPECTION AND TESTING

To assure that the supply and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his subcontractor's premises or at the Site or at any other place of work, are in accordance with the Specifications, the Contractor shall adopt suitable quality assurance program to control such activities at all points necessary. Such program shall be outlined by the Contractor and shall be finally accepted by the Employer after discussions before the award of the Contract. A quality assurance program of the Contractor shall generally cover, but not be limited to the following:

(a) His organization structure for the management and implementation of the proposed quality assurance program.

(b) Documentation control system.

(c) Qualification data for bidder's key personnel.

(d) The procedure for purchases of materials, parts, components, and selection of subcontractors' services including vendor analysis, source inspection, incoming raw materials inspection, and verification of materials purchases.

(e) System for shop manufacturing including process controls and fabrication and assembly controls.

(f) Control of non-conforming items and system for corrective actions.

(g) Control of calibration and testing of measuring and testing equipment. (h)

Inspection and test procedure for manufacture.

(i) System for indication and appraisal of inspection status.

(j) System for quality audits.

(k) System for authorizing release of manufactured products to the Employer. (l)

System for maintenance of records.

(m) System for handling storage and delivery.

(n) A quality plan detailing out the specific quality control procedure adopting for controlling the quality characteristics relevant to each item of supply.

The quality plan shall be mutually discussed and approved by the Employer after incorporating necessary corrections by the Contractor as may be required.

- Quality Assurance Documents

The Contractor shall be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of Employer's inspection of material/equipment.

The Employer, through his duly authorized representatives, reserves the right to carry out Quality Audit and Quality Surveillance of the systems and the procedures of the Contractor's and the subcontractor's Quality Management and Control Activities.

- Inspection, Testing and Inspection Certificates

The provisions of the clauses on Test and Inspection of the General Conditions of Contract and Special Conditions of Contract shall be applicable to the supply and erection portions of the Works. The Employer shall have the right to re-inspect at his expenses, any material though it would have been previously inspected and approved by him at the Contractor's works before, and if, after the same are inspected at Site following the latter, material is found defective, then the Contractor shall bear the cost of this inspection and reinstatement according to specification.

1.4 TESTS AT MANUFACTURERS WORKS

1.4.1 General

Where no specific test is specified, then the various items of materials and equipment shall be tested in accordance with the relevant British, IEC, or American Standards. Where no appropriate standard is available, tests shall be carried out in accordance with the maker's standard practice, which shall be subject to the Employer's approval.

At least fourteen days' prior notice, in writing or by tele-fax, shall be given to the Employer of the readiness of the plant for test or inspection and every facility shall be provided by the Contractor and sub-Contractor (s) to enable the Employer or their Representative to carry out the inspections and witness the tests. This includes progress, test rig and packing inspections also.

Inspection of equipment will not be carried out unless the Employer has approved copies of the relevant sub-orders, drawings and test procedures. No equipment shall be packed, prepared for shipment, or dismantled for the purpose of packing for shipment, unless it has been satisfactorily inspected, or inspection has been waived by the Employer.

Functional electrical and mechanical tests shall be carried out on the completed plant after assembly in the Works. The extent and method of recording the results shall be agreed by the Employer in sufficient time to enable the tests to be satisfactorily witnessed or to make any, changes to the proposed program of tests. All instruments and apparatus used in the performance of the tests shall be subject to the approval of the Employer and, if required by the Employer, shall be calibrated to an agreed standard at a laboratory of national standing

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of

33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

to be nominated by the Contractor and approved by the Employer. The costs of carrying out such calibration shall be borne by the Contractor in all cases.

The costs of making/performing any test shall be borne by the Contractor. This shall apply to tests performed at the site or elsewhere.

The Contractor shall at its own expense and at no cost to the Employer carry out all such tests and/or inspections of the Goods and Related Services.

All reasonable facilities and assistance, including access to drawings and production data, shall be furnished to the inspectors at no charge to the Employer.

The Employer or its designated representative shall be entitled to attend the tests and/or inspections, provided that the Employer bear all of its own costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging and pocket expenses.

The Contractor shall submit detailed tests protocols including programs, procedures and schedules, subject to approval by the Employer/Engineer before the start of tests.

Whenever the Contractor is ready to carry out any such test and inspection, it shall give a reasonable advance notice, including the place and time, to the Employer. The Contractor shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Employer or its designated representative to attend the test and/or inspection.

The Contractor shall provide the Employer with a report of the results of any such test and/or inspection.

The Employer may reject any Goods or any part thereof that fail to pass any test and/or inspection or do not conform to the specifications. The Contractor shall either rectify or replace such rejected Goods or parts thereof or make alterations necessary to meet the specifications at no cost to the Employer, and shall repeat the test and/or inspection, at no cost to the Employer, upon giving a notice.

The Contractor agrees that neither the execution of a test and/or inspection of the Goods or any part thereof, nor the attendance by the Employer or its representative, nor the issue of any report, shall release the Supplier from any warranties or other obligations under the Contract.

After receiving the prior information about the completion of manufacturing at the factory, the Employer will depute his personnel to the Contractor's factory to witness the fabrication, assembly and testing of any or all parts of major equipment. The number of the Employer's personnel and equipment to be witnessed will be as listed below. The duration of such visits shall be as per inspection/testing requirements.

(1) 33/11 kV, 6/8 MVA Power Transformer

- | | |
|--|----------------------------------|
| a) Initial Inspection (Core & Winding) | 2 persons, 1 visit |
| b) Pre Dispatch Inspection | 3 persons, 1 visit (Third Party) |

(2) 12 kV Switchgear, 33 kV Circuit Breaker

and 33 kV Control & Relay Panel

and Instrument Transformers 2 persons, 1 visit

(3) Battery & Battery Charger 1 person, 1 visit

The Inspection and Testing works of the power transformer and all other materials shall be carried out at the manufacture's Factory premises. The minutes of meeting of the inspection and testing works shall be prepared. The inspection reports as well as minutes of meeting shall be mentioned with, whether the results of inspection and testing comply with the Technical Specifications of the contract agreement or not. After successful inspection and testing, the power transformers and other materials shall be sealed and packed in presence of the Employer's inspectors/representative(s) and the same materials shall be dispatched. The photographs of the sealing/packing/of materials along with the inspectors/representative(s) of the Employer/contractor/ manufacturer shall be submitted with the inspection and testing report.

Upon arrival the power transformers shall be subjected to the test at NEA owned or nominated lab as per **clause 1.14.7** of technical specifications.

1.4.2 Test Certificates

Within 30 days of the completion of any test, triplicate sets of all principal test records, test certificates and performance curves shall be supplied to the Employer.

These test records, certificates and performance curves shall be supplied for all tests, whether or not they have been witnessed by the Employer or his representative. The information given on such test certificates and curves shall be sufficient to identify the material or equipment to which the certificate refers and should also bear the Contract reference title. Specified requirements shall be shown on each certificate for comparison with actual test results.

When all equipment has been tested, test certificates of all factory and site tests shall be compiled by the Contractor into volumes and bound in an approved form complete with index. Two copies of each volume shall be supplied to the Consultant and five copies to the Employer.

1.4.3 Type Tests

Type tests are required to prove the general design of the equipment and the Contractor may submit certificates of such design tests, which have been carried out on identical equipment. Notwithstanding any provision in BS, IEC or ANSI Standards, the Employer shall have the right to accept such certificates in lieu of the specified type tests or to reject them.

The type tests prescribed shall be carried out at the Contractor's cost in all cases, where either such certificates are not available or are rejected by the Employer.

1.5 RESPONSIBILITIES

To ensure that the test jurisdiction and transfer of responsibilities is regulated by strict safety and handover procedures, the Contractor agrees the interface with the Employer to establish and implement handover procedures consistent with the terms of these Specifications.

The Employer shall retain full jurisdiction over all commissioning activities, which may affect the operation of the existing system. In these circumstances and when so requested, shall provide technical advices and assistances.

The Contractor shall be responsible for technical guidance and assistance in establishing the scope and

method of tests, witnessing of the testing, assessment of results, and re-negotiation of the changes in test schedules which may be necessary as a result of other circumstances, such as delays in the delivery, possible equipment failures.

1.6 SAFETY PROCEDURES

The Contractor shall share the responsibility for safety procedures with the Employer. The Contractor shall establish and implement a work permit and tagging system and associated safety procedures (subject to the review of Employer) for all equipment, systems and areas not covered by the Employer's safety procedures.

The Employer will assume responsibility for the establishment and implementation of tagging, safety and work permit procedures for the protection of personnel and equipment, as soon as equipment and systems are connected to or are energizable from the existing system.

1.7 TRAINING OF THE EMPLOYER'S STAFF AND CONTRACTOR'S PERSONNEL

The Contractor shall plan for the Employer's staffs' participation, either continuously or on a regularly recurring basis, in the commissioning work and:

Allow the Employer's staffs to become familiar with the operating and maintenance aspects of the new equipment supplied by him,

Maintain a continuing assessment with the Employer of the precautions required in or possible consequences of, initial energization of equipment, Allow for the above two necessary objectives in the preparation of schedules.

The Contractor shall station at site, Two (2) nos. Electrician of Level -3, Two(2) nos. Electrician of Level -4 and One (1) no. Electrician of Level -5 for a minimum of one year continuously after commissioning to rectify any problems, and train the Employer's attending staffs. If required, the length of the stay shall be extended as per requirement, which shall be at the Employer's discretion.

The Employer's personnel shall receive on-the-job training in the handling, erection, testing and commissioning of all the mechanical and electrical equipment under the Contract. As far as possible the Employer's personnel trainees shall be integrated into the Contractor's work crews and shall receive full practical experience.

The programme of on-the-job training of the Employer's Personnel in the handling, erection and testing of mechanical and electrical equipment shall include appropriate time scheduling and grouping of the on-the-job training;

The Contractor shall provide those of his own construction and management personnel who are responsible for on-the-job training, to ensure that the Employer's trainees obtain the maximum benefit from these activities. This training shall be organised and supervised by the Training Manager, and shall be scheduled to be compatible with the programmes of training of the Employer's personnel.

1.8 COMMISSIONING STAFF

The Contractor shall provide commissioning personnel including skilled and unskilled labor as required. Submit a list with names, experience and proposed duration of the stay of key personnel on site, consistent with the construction schedule, along with the commissioning program.

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

Ensure that only staffs assigned to commissioning fulfills that duty for the duration of the assignment.

Ensure that commissioning staffs have authorization, and the competence, to undertake minor repairs or to make temporary redesigns and to reconnect systems to meet the specified system performance to preclude delays in energization and putting into commercial service of any part of the works.

1.9 TEST EQUIPMENT

The Contractor shall ensure that all instruments, tools and other equipment required for testing and commissioning are available on site, ensure that the test equipment is of satisfactory quality and condition and, where necessary, is calibrated by an approved authority or standard.

Make arrangements for the provision of power supplies for testing with necessary vector configuration, voltage and current rating.

1.10 COMMISSIONING PROGRAM

Prepare a commissioning program for approval by the Employer and for incorporation into the Project master construction program. Allocate adequate time in this program to permit full commissioning of all components.

Carry out all testing during normal working hours as far as practicable. Tests, which involve existing apparatus and system outages, may be carried out outside normal working hours. Give the Employer sufficient notice to allow for the necessary outage arrangements to be made in conformity with the testing program.

Note that no tests listed in the agreed program will be waived except upon the instructions or consent of the Employer in writing.

1.10.1 Test Procedures

The following basic tests, in addition to others, shall be carried out:

- Measurement of insulation resistance.
- AC withstand voltage test

1.10.2 Requirements for Field Tests

The field tests shall be carried out in presence of Employer under the following conditions:

AC withstand test voltages for conductors and outdoor equipment shall be normal operation voltage of the transmission line and, withstand voltage test shall be carried out for ten (10) minutes by the normal voltage mentioned above. The field tests shall be carried out by the Contractor after adjustment of all the equipment have been completed.

Expandable and lead wires and other materials required for the field tests shall be arranged by the Contractor. The Contractor shall be responsible for providing all measuring instruments, test equipment and tools required for the tests.

Preparation of the test record sheets and test reports shall be the responsibility of the Contractor and the

results of the field tests shall be submitted by the Contractor for Employer's approval.

Measurement of insulation resistance of the equipment shall be performed by at least 1000 V meggar.

After completion of the measurement of insulation resistance mentioned above, ac withstand voltage test shall be performed by the normal operation voltage of the existing power system in accordance with the following procedure:

- 11 and 33 kV Main Circuit: The 11 kV and 33 kV circuit breakers and disconnecting switches, except for circuit breakers receiving power for the test from the existing power system through a transmission line, shall be closed, succeeding, normal operation voltage shall be charged on the equipment and bus conductors for ten (10) minutes for ac withstand voltage test. The indication value of meters mounted on the board during the ac withstand voltage test shall be recorded on the test record sheets prepared by the Contractor.

Submit test procedures, consisting of detailed test methods and samples of the related test record forms, for all equipment to be tested, to the Employer for approval along with the commissioning program. Strictly adhere to these procedures for the commissioning tests.

1.10.3 Records

Maintain an up-to-date record of all commissioning activities on site.

Record the results of the tests clearly on forms and formats approved by the Employer and with clear references to the equipment and items tested, so that the record can be used as the basis for maintenance tests, in future. Submit the required number of site test records to the Employer as soon as possible after completion of the tests.

Record the details of the test equipment and instruments used in the test sheets, in those cases where the instrument or equipment characteristics can have a bearing on the test results.

1.10.4 "As-Built" Drawings

Keep an ongoing record of all changes on a master set of drawings. Produce and supply a minimum of five complete sets of marked-up "As Constructed/As-Built" drawings before leaving the Site. Correct and re-issue the original drawings as soon as possible as per this specification.

1.10.5 Test Methods

Carry out all necessary tests for commissioning the substations. The following clauses detail the tests which are considered to represent the minimum required in addition to those specified under the appropriate IEC Publications, other approved standards and the manufacturer's instructions for each item of equipment.

Strictly adhere to the methods of testing approved by the Employer.

A) Site and Commissioning Tests for Main and Auxiliary Equipment

General Checks:

Make a general check of all main and auxiliary equipment. Include a check of the completeness, correctness and condition of ground connections, labeling, arcing ring, paint surfaces, cables, wiring, pipe-work, valves, blanking plates and all other auxiliary and ancillary items.

Check for oil and gas leaks and that insulators are clean and free from external damage. Check that loose items, which are to be handed over to the Employer, e.g., blanking plates, tools, spares, etc. are in order and are correctly stored or handed over.

Power Transformers

Make all tests as per commissioning tests called for in the Manufacturers' instructions manual.

Record and submit to Employer in a hardcover binder, all test data obtained.

Circuit Breaker Tests

Check and set pressure switches settings when required. Also test mechanical operating systems.

Carry out contact resistance tests. In the case of multi-interrupter circuit breakers, perform resistance tests at each interrupter or pair of interrupters as well as through the series of interrupters on each pole.

Test local and remote trip/close operation and perform circuit breaker and auxiliary contact timing tests on all circuit breakers.

Control/ Relay Panels, energy meters and Switchboards

Carry out general testing and inspection, as referred to above. The Contractor shall also carry following tests: a) Carrier signal testing b) protective relay testing c) Instrument transformers testing c) Phase correcting testing. Functionally test and perform the timing tests on circuit breakers and AC and DC circuits, associated with stand-by auxiliary supplies and stand-by generating sets, particularly where automatic operation is defined.

Carry out insulation measurement tests of secondary circuits with a 1000 V DC meggar before and after high voltage testing.

Check shutters, interlocking, earth procedures and the inter-changeability of components. Carry out a high voltage 50 Hz dielectric test on each bus at 75% of the specified value for the equivalent factory test.

Disconnecting Switch and Earth Switches

Test all disconnecting switch and earth switches operationally to confirm contact pressures, contact resistance, simultaneous-operation of all phases and the ease of operation.

Check the local and remote indications and the operation of auxiliary contacts. Check the earthing mat at the operating positions and check the availability of connecting points for maintenance earthing arrangements.

Test the earth switches and maintenance earthing devices to confirm the opening and closing sequences and check the ground mat connections, indications and manual locking devices.

Lightning Arresters

Inspect and verify the condition and satisfactory mounting of the arresters and their earth connections, electrodes and operation counters. Note the counter readings.

Busbars and Connections

Test flexible busbars and connections to ensure that the correct tensions, sags and clearances will be maintained over the range of environmental conditions and loads without stress to other equipment. If Dynamometers are used to check the sags and tensions, check them before and after use.

Check rigid busbars and connections to ensure that the busbars will not cause overloading of the supporting insulators under load conditions and under the range of climatic variations applicable to the Site. Ensure that expansion and contraction of the equipment is fully accommodated by flexible connections.

Test conductivity on selected connections and joints.

Perform high voltage DC tests on all HV cables and isolated phase bus bars at 75% of the specified value for the equivalent factory test. Carry out with at least 1000 V DC meggar the insulation measurement test, before and after high voltage tests.

Batteries and Battery Charging Equipment

Test the insulation to earth of the complete DC system. Test the batteries and chargers to confirm the charger ratings, adjustment, alarm systems and battery capacity for the specified length of time at maximum expected loading. Record the specific gravity and cell voltages of the batteries during the initial charge and when fully charged and maintain proper regular records until the battery is taken over by the Employer.

Interlocking: Check all interlocking arrangements, both electrical and mechanical.

B) Earthing System

Carry out the tests and measurements in accordance with IEEE Standard 80. Test the effectiveness of the bonding and earthing and make conductivity tests on selected joints on the main earthing system and at the connections to equipment and structures. Check the precautions taken to avoid corrosion attack on the earthing system.

Measure the resistance of the earthing system to the remote earth indicating method and equipment used. Separate test probes of minimum 300 to 600 meters length to effectively test the earthing system. Perform earthing resistance measurements with the transmission line earth wires disconnected from the grounding grid.

C) Area Lighting

Check all lighting circuits including the operation of relevant photoelectric cells and remote/local

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of

33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

commands. Measure the lighting levels throughout the substation on horizontal surface 800 mm above ground level and on all vertical surfaces of transformers, marshaling kiosks, etc. Measure the lighting levels in the area surrounding the substation up to 20 m from the fence.

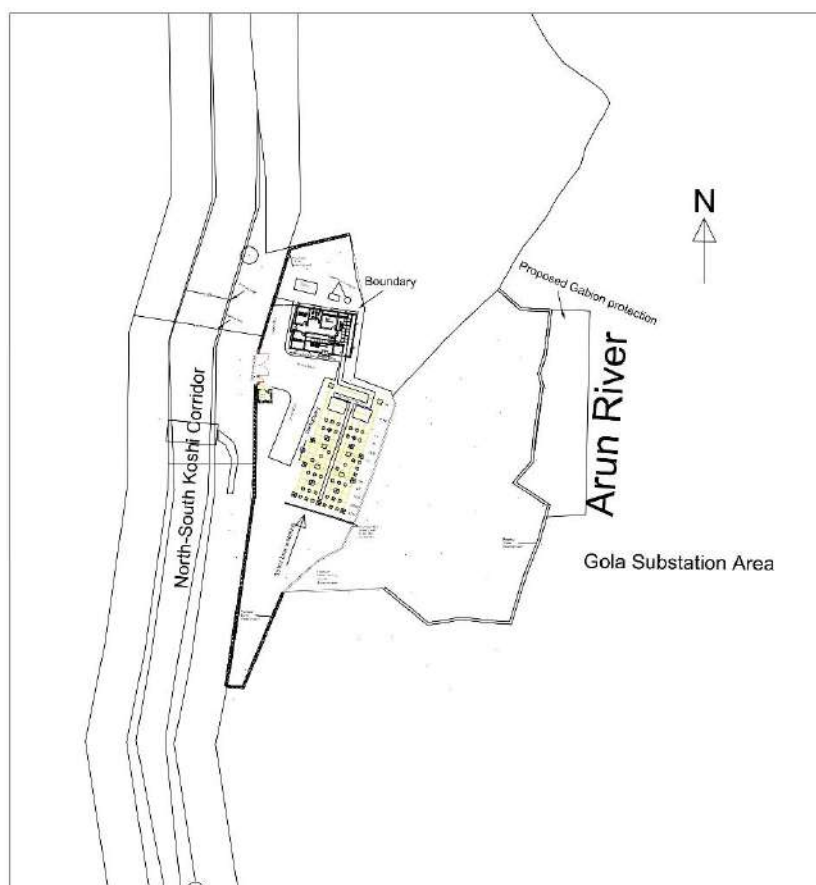
D) Particular Constraints and Special Tests

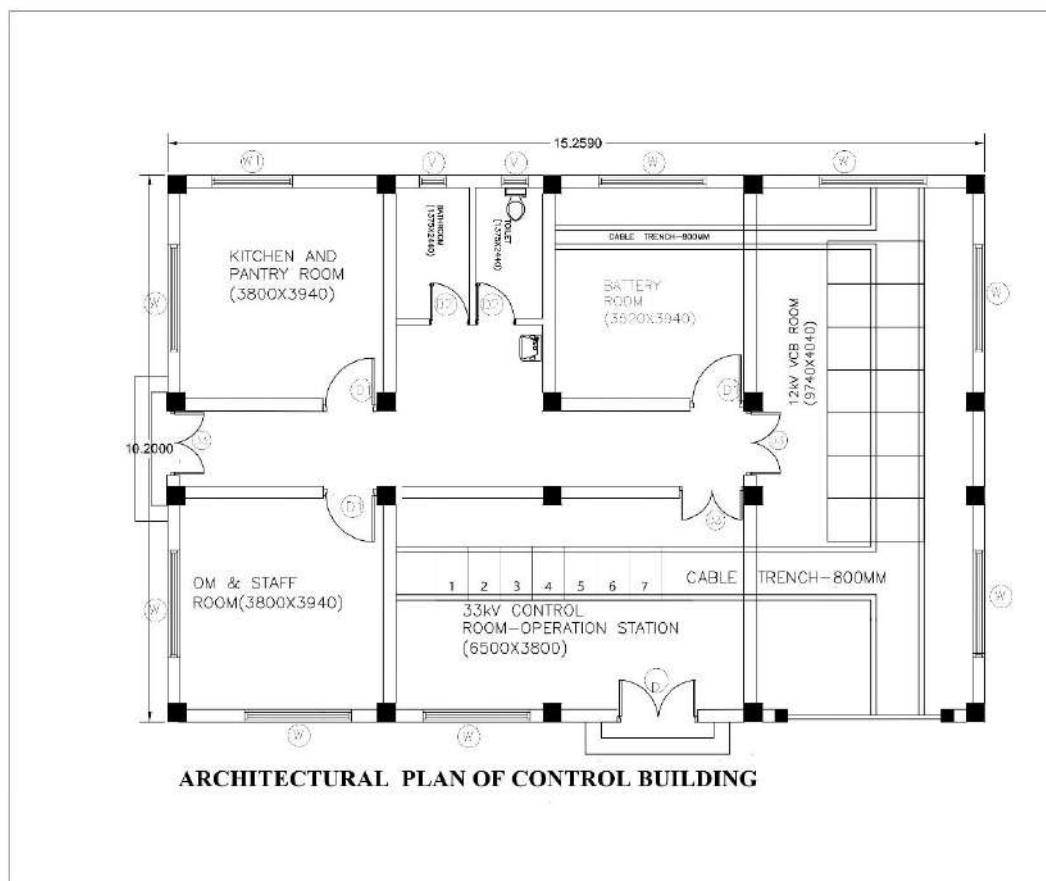
The Contractor shall be prepared to cooperate with any special tests requested by the Employer.

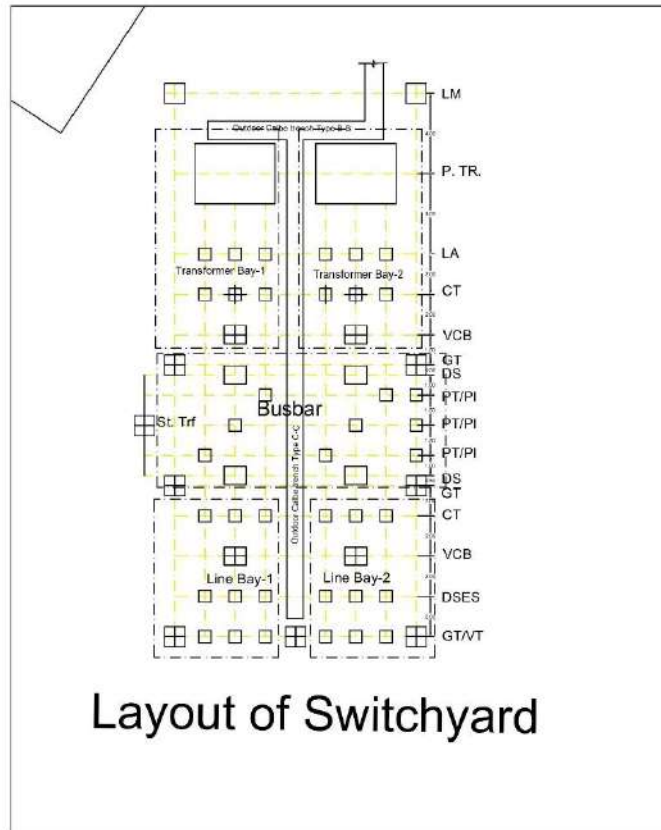
Drawings

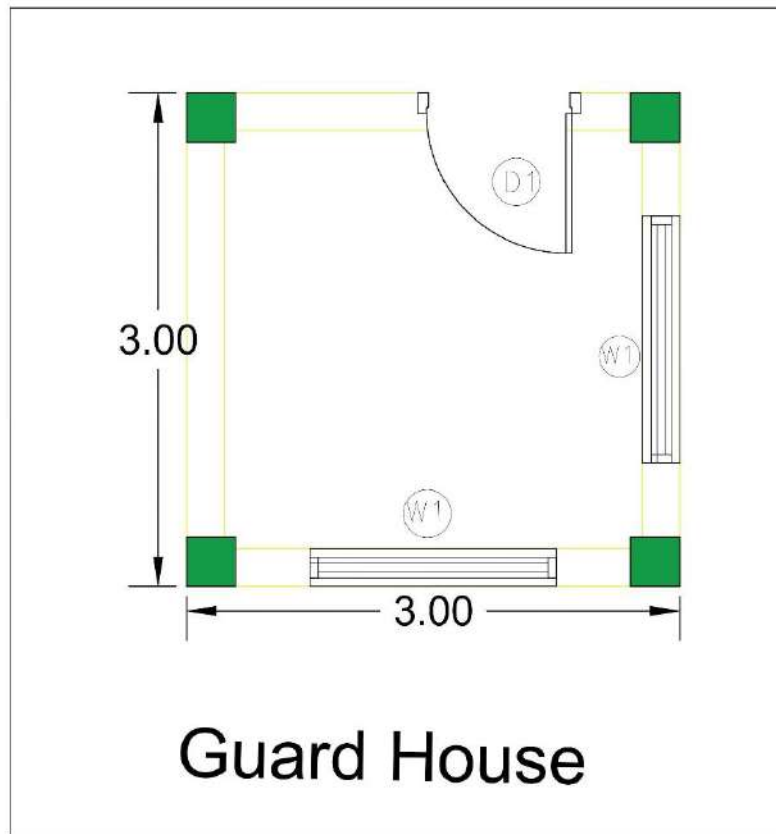
Note:

1. It is customary to bind the drawings in a separate volume, which is often larger than other volumes of the contract documents. The size will be dictated by the scale of the drawings, which must not be reduced to the extent that details are reduced illegible.
2. A simplified map showing the location of the Site in relation to the local geography, indicating major roads, posts, airports, and railroads, is helpful.
3. The construction drawings, even if not fully developed, must show sufficient details to enable bidders to understand the type and complexity of the work involved and the price the Bill of Quantities.

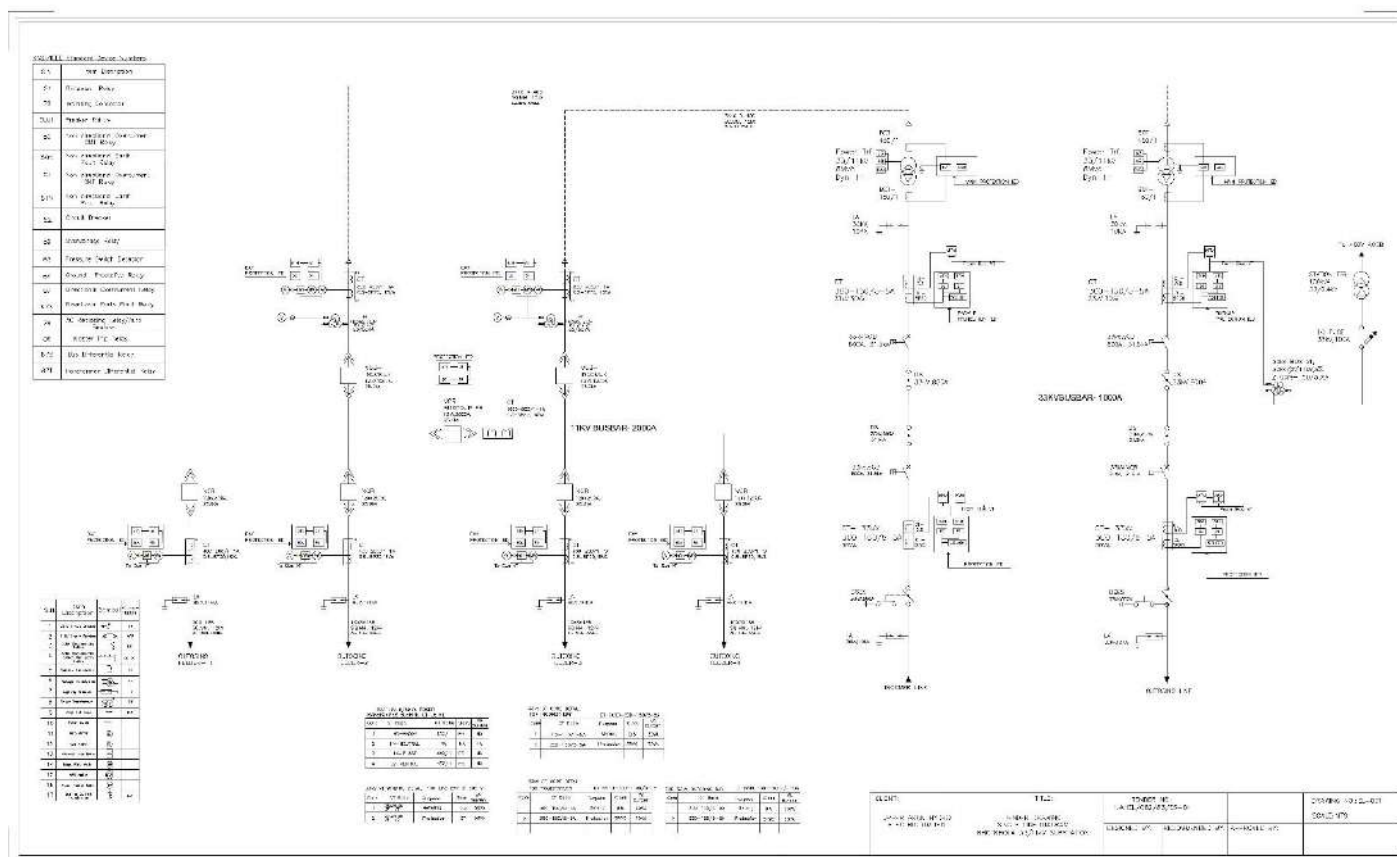






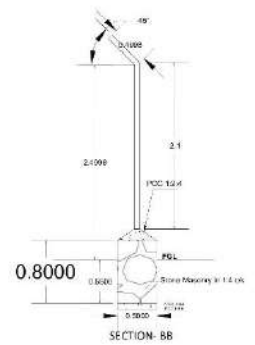
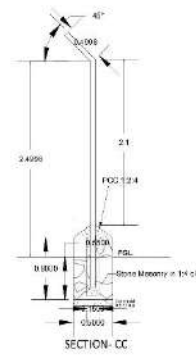
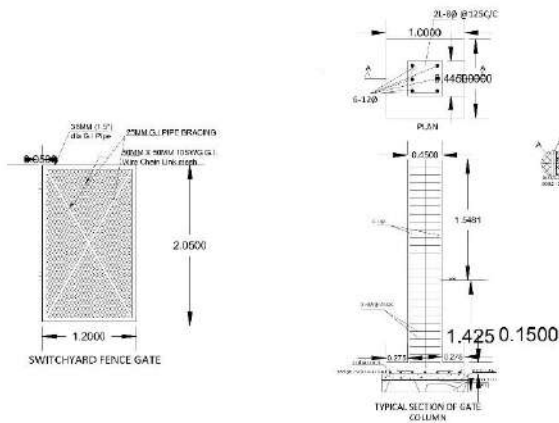
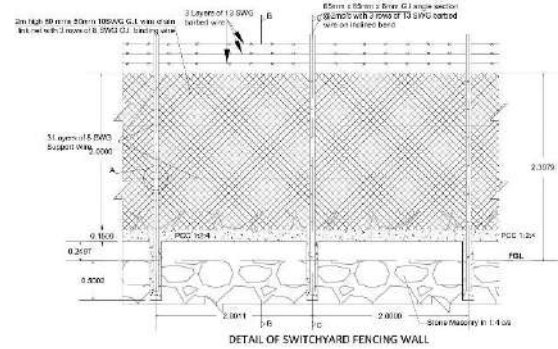
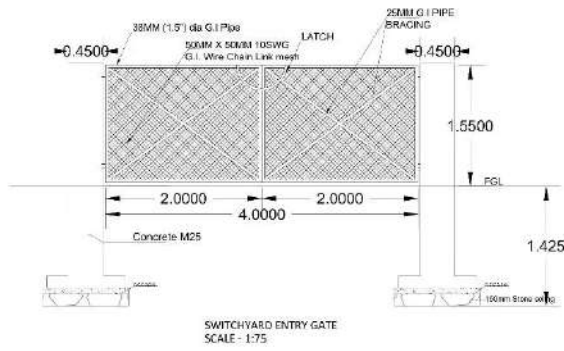


Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

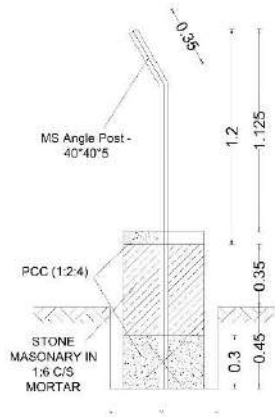


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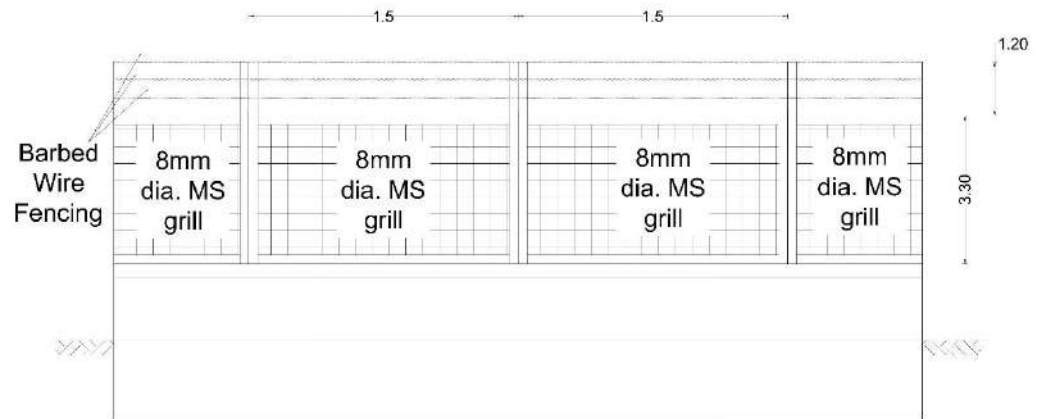
Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District



**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

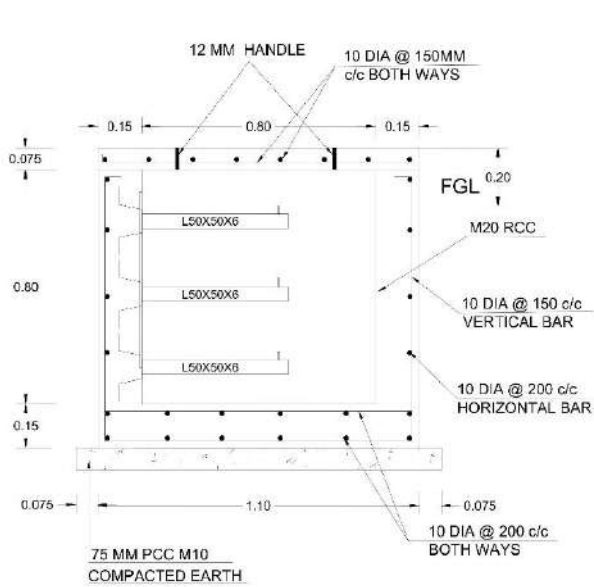


TYPICAL SECTION OF BOUNDARY FENCING

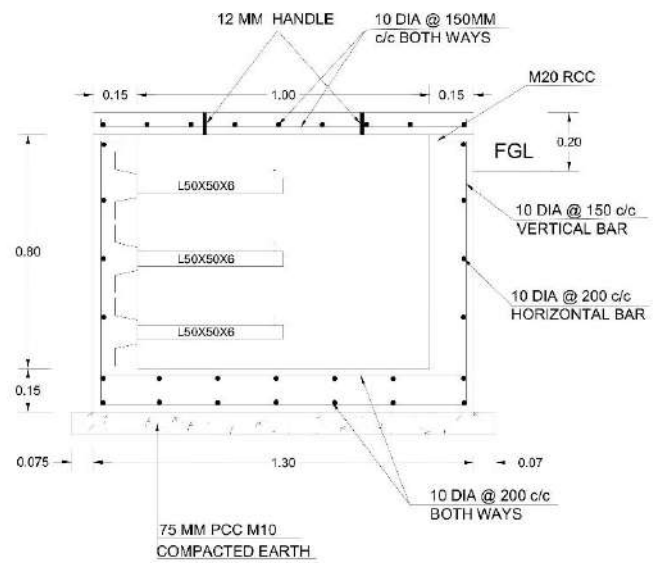


TYPICAL ELEVATION OF BOUNDARY FENCING

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

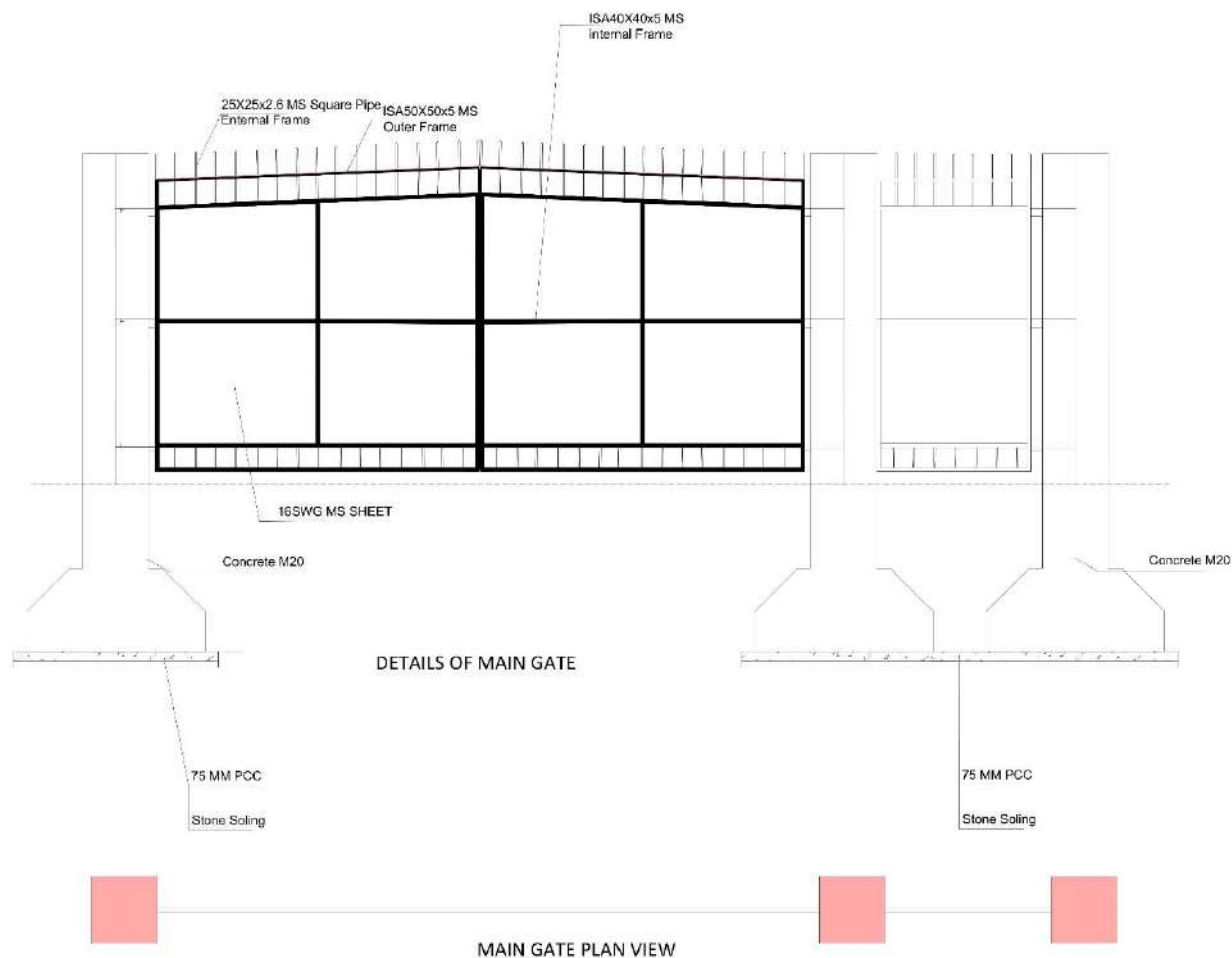


TYPE C-C



TYPE B-B

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District



Personnel Requirements

Using Form PER-1 and PER-2 in Section IV (Bidding Forms), the Bidder must demonstrate it has personnel that meet the following requirements:

No.	Position	Academic Qualification	Total Work Experience [Years]	Experience in Similar Works [years]
1.	Project Manager	Graduate Electrical Engineer	5	3
2.	Project Engineer	Bachelor Electrical Engineer	3	2
3.	Site Incharge	Diploma Electrical Engineer	5	2

In case the bidder proposes to consider Personnel that may be spared from committed/ongoing contracts for evaluation, the bidder shall provide details of personnel which will be spared from such committed/ongoing contracts based on the physical progress at the date of bid submission. The details so submitted by the bidder and the physical progress of the ongoing contracts only the spared personnel shall be taken into the consideration during evaluation.

The Bidder shall provide details of the proposed personnel and their experience records in the relevant Information Forms included in Section 4 (Bidding Forms).

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**



Equipment Requirements

Using Form EQU in Section IV (Bidding Forms), the Bidder must demonstrate it has the key equipment listed below:

No.	Equipment Type and Characteristics	Min. Number Requirement
1.	Protection testing and calibration equipment	1
2.	Cable Testing Equipment	1
3.	Oil filter machine	2
4.	Relay Test Kit	2
5.	5 kV Megger	1

In case the Bidder proposes to consider Equipment that may be spared from committed/ongoing contracts for evaluation, the Bidder shall provide details of Equipment which will be spared from committed / ongoing contracts clearly demonstrating the availability of such equipment with respect to the physical progress of the ongoing contracts on the date of bid submission. Based on the details so submitted by the Bidder, only the spared equipment proposed for the contract shall considered for evaluation.

In case of Equipments to be leased/hired the same procedures as mentioned above shall apply. The Bidder must demonstrate that it has the required equipments and bidder shall provide details of the proposed equipments in the relevant information forms included in Section 4 (Bidding Forms).

The Bidder/Lease Owner shall be solely responsible for the data provided. However, this shall not limit the right of employer to verify the authenticity of submitted information. The Bidder shall provide further details of proposed items of equipment using the relevant Form in Section 4 (Bidding Forms)

Section VII: Bill of Quantities⁶

Notes for Unit Rate Contracts:

Objectives

The objectives of the Bill of Quantities are

- (a) to provide sufficient information on the quantities of Works to be performed to enable Bids to be prepared efficiently and accurately; and*
- (b) when a Contract has been entered into, to provide a priced Bill of Quantities for use in the periodic valuation of Works executed.*

In order to attain these objectives, Works should be itemized in the Bill of Quantities in sufficient detail to distinguish between the different classes of Works, or between Works of the same nature carried out in different locations or in other circumstances which may give rise to different considerations of cost. Consistent with these requirements, the layout and content of the Bill of Quantities should be as simple and brief as possible.

Content

The Bill of Quantities should be divided generally into the following sections:

- (a) Preamble;*
- (b) Work Items (grouped into parts);*
- (c) Day works Schedule;*
- d) Provisional Sums; and*
- (d) Summary.*

Preamble

The Preamble should indicate the inclusiveness of the unit prices, and should state the methods of measurement which have been adopted in the preparation of the Bill of Quantities and which are to be used for the measurement of any part of the works.

Work Items

The items in the Bill of Quantities should be grouped into sections to distinguish between those parts of the Works which by nature, location, access, timing, or any other special characteristics may give rise to different methods of construction, or phasing of the Works, or considerations of cost. General items common to all parts of the works may be grouped as a separate section in the Bill of Quantities.

Day work Schedule

A Day work Schedule should be included only if the probability of unforeseen work, outside the items included in the Bill of Quantities, is high. To facilitate checking by the Employer of the realism of rates quoted by the Bidders, the Day work Schedule should normally comprise the following:

- (a) A list of the various classes of labour, materials, and Constructional Plant for which basic day work rates or prices are to be inserted by the Bidder, together with a statement of the conditions under which the Contractor will be paid for work executed on a day work basis.*
- (b) Nominal quantities for each item of Day work, to be priced by each Bidder at Day work rates as bid. The rate to be entered by the Bidder against each basic Day work item should include the Contractor's profit, overheads, supervision, and other charges.*

⁶In lump sum contracts, delete "Bill of Quantities" and replace with "Schedule of Activities" throughout this section.

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

Provisional Sums

Provisional Sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Project Manager in accordance with the Conditions of Contract.

Summary

The Summary should contain a tabulation of the separate parts of the Bill of Quantities carried forward, with provisional sums for Day work, for physical (quantity) contingencies, and for price contingencies (upward price adjustment) where applicable.

Preamble of Bill of Quantities

A. General

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications, and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Project Manager and valued at the rates and prices bid in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Project Manager may fix within the terms of the Contract.
3. For any item for which measurement is based on records made before or during construction the records shall be prepared and agreed between the Engineer and the Contractor. Should the Contractor carry out such work without the prior agreement of the Engineer, the Engineer may request the Contractor to carry out investigations to confirm the extent of the work and the quantity of work certified for payment shall be solely at the Engineer's discretion. The cost of any such investigation shall be borne by the Contractor.
4. The rates and prices bid in the priced Bill of Quantities shall, except as otherwise provided under the Contract, include all construction equipment, labor, supervision, materials, erection, maintenance, insurance, profit, taxes, and duties, together with all general risks, liabilities, and obligations set out or implied in the Contract.
5. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
6. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
7. General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities. The Specification Clause references where given in the item description of the Bills of Quantities are for the convenience of bidders and generally refer to the principal relevant-specification clause but do not necessarily represent the whole of the specification requirements for the work required within the item. The presence of a Specification clause reference shall not in any way reduce the Bidders obligation to complete work in accordance with all the requirements of the Specification.
8. Provisional Sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Project Manager in accordance with the Conditions of Contract.
9. The method of measurement of completed work for payment shall be in accordance with the Specifications.
10. The abbreviations and symbols used in this Bill of Quantities are: ***[Insert as applicable]***

B. Day work Schedule

a) General

1. Work shall not be executed on a day work basis except by written order of the Project Manager. Bidders shall enter basic rates for day work items in the Schedules. These rates shall apply to any quantity of day work ordered by the Project Manager. Nominal quantities have been indicated against each item of day work, and the extended total for day work shall, be carried forward as a Provisional Sum to the Summary Total Bid Amount. Unless otherwise adjusted, payments for day work shall be subject to price adjustment in accordance with the provisions in the Conditions of Contract.

b) Day work Labor

1. In calculating payments due to the Contractor for the execution of day works, the hours for labor will be reckoned from the time of arrival of the labor at the job site to execute the particular item of day work to the time of departure from the job site, but excluding meal breaks and rest periods. Only the time of classes of labor directly doing work ordered by the Project Manager and are competent to perform such work will be measured. The time of gangers (charge hands) actually doing work with the gangs will also be measured but not the time of foremen or other supervisory personnel.
2. The Contractor shall be entitled to payment in respect of the total time that labor is employed on day work, calculated at the basic rates entered by it in the " SCHEDULE OF DAY WORK RATES: 1. LABOR". The rates for labor shall be deemed to cover all costs to the Contractor including (but not limited to) i) the amount of wages paid to such labor, transportation time, overtime, subsistence allowances, ii) any sums paid to or on behalf of such labor for social benefits in accordance with Nepal law, iii) Contractor's profit, overheads, superintendence, liabilities and insurance and iv) charges incidental to the foregoing.

c) Day work Equipment

1. The Contractor shall be entitled to payments in respect of Constructional Plant already on site and employed on day work at the basis rental rates entered by him in the "SCHEDULE OF DAY WORK RATES:2 EQUIPMENT". The said rates shall be deemed to include due and complete allowance for depreciation, interest, indemnity and insurance, repairs, maintenance, supplies, fuel, lubricant, and other consumables and all overhead, profit and administrative costs related to the use of such equipment. The cost of drivers, operators and assistants also shall be included in the rate of the equipment and no separately payment shall be made for it.
2. In calculating the payment due to the Contractor for Constructional Plant employed on day work, only the actual number of working hours will be eligible for payment, except that where applicable and agreed with the Project Manager, the travelling time from the part of the Site where the Construction Plant was located when ordered by the Project Manager to be employed on day work and the time for return journey there to shall be included for payment.

d) Day work Materials

1. The Contractor shall be entitled to payment in respect of materials used for day work (except for materials for which the cost is included in the percentage addition to labor costs as detailed heretofore), at the rates entered by him in the "SCHEDULE OF DAY WORK RATES: 3 MATERIALS" and shall be deemed to include overhead charges and profit as follows;
 - (i) the rates for materials shall be calculated on the basis of the invoiced price, freight, insurance, handling expenses, damage, losses, etc. and shall provide for delivery to store for stockpiling at the Site.
 - (ii) the cost of hauling materials for use on work ordered to be carried out as day work, from the store or stockpile on the Site to the place where it is to be used also shall be include in the same rate.

Provisional Sums

The estimated cost of specialized work to be carried out, or of special goods to be supplied, by other contractors should be indicated in the relevant part of the Bill of Quantities as a particular provisional sum with an appropriate brief description. A separate procurement procedure is normally carried out by the Employer to select such specialized contractors. To provide an element of competition among the Bidders in respect of any facilities, amenities, attendance, etc., to be provided by the successful Bidder as prime Contractor for the use and convenience of the specialist contractors, each related provisional sum should be followed by an item in the Bill of Quantities inviting the Bidder to quote a sum for such amenities, facilities, attendance, etc.

Section VII: Bill of Quantities

Bidder shall download the bidding document and fill the BOQ provided and upload it.

UPPER ARUN HYDROELECTRIC LIMITED
(A SUBSIDIARY COMPANY OF NEA)

Summary of Cost

S. No.	Description of Works	Total Amount (NRs)	Remarks
1. General Items			
A	Provision for Insurance		One time payable item until the contract completion
B	Provision for Performance Guarantee		One time payable item until the contract completion
C	Provision for Advance Payment Guarantee		One time payable item until the contract completion
D	Operation cost of Manpower (2 nos. Electrician Level -3, nos. Electrician Level -4 and 1 no. Electrician Level -5) and on the site training		
	Sub-Total of 1		
2. Design Services			
A	Pre Construction Survey (PCSE) and As-Built Survey works		
	Sub-Total of 2		
3. Electrical Substation works			
A	Supply and delivery of Materials		
B	Installation, testing and commissioning		
C	Spare parts & maintenance equipment/ instruments		
	Sub-Total of 3		
4. Civil Works			
A.	SUBSTATION		
A.1	Civil works for Switchyard & Cable trench		
A.2	Landscaping Works		
A.3	Control Building Works		
A.4	Guard house building		
A.5	Roads and Drainage		
	Sub-Total of 4		
5	Total (Design Services, Electrical Substation works and Civil Works) 1+2+3+4		
6	VAT (13% of 5)		
	Grand Total with VAT (5+6)		

Date :
Place :

Signature :
Printed Name :
Designation :
Common Seal :

**UPPER ARUN HYDROELECTRIC LIMITED
(A SUBSIDIARY COMPANY OF NEA)**

Bidder's Name & Address:

1. General items

Item	Description	Unit	Quantity	Amount	Remarks
A.	Substation				
A	Provision for Insurance	LS			
B	Provision for Performance Guarantee	LS			
C	Provision for Advance Payment Guarantee	LS			
D	Operation cost of Manpower (2 nos. Electrician Level-3, nos. Electrician Level -4 and 1 no. Electrician Level -5) and On the site training for Employer's personnel	LS			
Total Amount					

Date :
Place :

Signature :
Printed Name :
Designation :
Common Seal :



UPPER ARUN HYDROELECTRIC LIMITED
(A SUBSIDIARY COMPANY OF NEA)

Bidder's Name & Address:

1. Design Services

Item	Description	Unit	Quantity	Unit Price excluding VAT; NRs.	Unit Price in Words excluding VAT; NRs.	Total Price excluding VAT; NRs.	Remarks
A.	Substation						
1	Land mapping, Pre-Construction Survey, Design and Drawings of 33/11 kV Substation all complete as per the specification	Lot	1			-	
2	As-Built Drawings of 33/11 kV Substation as per the all complete as per the specification	Lot	1			-	
Total Amount						-	

Signature :

Printed Name :

Date :

Designation :

Place :

Common Seal :



UPPER ARUN HYDROELECTRIC LIMITED
(A SUBSIDIARY COMPANY OF NEA)

3. Electrical Substation and Bay Extension Works							
S. No.	Description	Qty	Unit	Unit Rate NRs	Rate (In Words)	Amount NRs.	Remarks
A	<u>Supply and delivery of Materials (Substation Equipment and Bay Extension)</u>						
A.1	Transformer						
1	33/11 kV, 6/8 MVA, 50 Hz, 3 Phase, ONAN/ ONAF, dyn11 Power Transformer with accessories all complete	1.00	Set				1 no's Power Transformer will be supplied by UAHEL
2	100 kVA 33/0.4, 50 Hz, dyn11 Station Transformer including 400 V MCCB and all required installation and connection accessories all complete	1.00	Set				
A.2	33 kV Switchgear						
1	33 kV, 800 A, 20 kA, TP Vacuum Circuit Breaker with all accessories as per specification	4.00	Set				
2	33 kV, 800 Amp, 20 kA, TP, single throw Disconnecting Switch without earth switch as per specification	4.00	Set				
3	33 kV, 800 Amp, 20 kA, TP, single throw Disconnecting Switch with earth switch as per specification	2.00	Set				
A.3	Instrument Transformers						
1	33 kV oil immersed, out door type single phase Current Transformer "300 - 150 / 5 - 5 Amp" (3 Nos. in one set) as per specification	4.00	Set				
2	33 kV single phase, oil filled, out door type Potential Transformer "33000/√3/110/√3 Volt" (3 Nos. in one set) as per specification	1.00	Set				
A.4	Lightning Arrestor						

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

3. Electrical Substation and Bay Extension Works							
S. No.	Description	Qty	Unit	Unit Rate NRs.	Rate (In Words)	Amount NRs.	Remarks
1	30 kV, 10 kA, Gapless, ZnO Lightning Arrestor (3 Nos. in one set) as per specification	4.00	Set				
2	9 kV, 10 KA Lightning Arrestor with Clamps(3 nos. in one set) as per specification [For 11k V feeder]	4.00	Set				
A.5	Control And Relay panel						
1	33 kV Line control and relay panel as per specification	2.00	set				
2	6/8 MVA Power Transformer control and relay panel as per Specification.	2.00	set				
3	33 kV AVR and OLTC Panel including accessories complete	2.00	set				
A.6	Busbar and Insulator						
1	33 kV Outdoor Busbar with required insulators, Busbar, Clamps etc. including all accessories all complete as per specification	1.00	Lot				
2	33 kV Post Insulator including accessories complete as per specification.	2.00	Set				
A.7	11 kV Switchgear						
1	12 kV, 1200 A, 25 kA Vacuum Circuit Breaker with Control Panel (12 kV switchgear Panel) for incoming feeder circuit complete with all accessories as per specification.	2.00	Set				
2	12 kV, 800 A, 25 kA Vacuum Circuit Breaker with Control Panel (12 kV switchgear Panel) for outgoing feeder circuit complete with all accessories as per specification.	4.00	Set				
3	12 kV, 2000 A, 25 kA Vacuum Circuit Breaker with Control Panel (12 kV switchgear Panel) for Buscoupler complete with all accessories as per specification.	1.00	Set				
A.8	Earthing						
1	Substation Earthing and grounding works all complete as per specification.	1.00	Lot				
2	Lightning protection for substation including lattice structure, shield wire, earthing rod, and accessories as per specification.	2.00	Set				
A.9	Station Supply						

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

3. Electrical Substation and Bay Extension Works							
S. No.	Description	Qty	Unit	Unit Rate NRs.	Rate (In Words)	Amount NRs.	Remarks
1	400 Volt AC Distribution Board all complete with accessories as per specification.	1.00	Set				
2	110 Volt DC Distribution Board all complete with accessories as per specification.	1.00	Set				
3	600 V, PVC insulated armoured, 3.5 core, 50 sq. mm. copper cable for Station supply & Battery Charger	200.00	m				
4	33 kV Power Fuse including accessories complete set	1.00	Set				
A.10	Control and Power Cables						
1	a)12 kV XLPE Power Cable (1×400 sq. mm. Copper Cable).	300.00	m				
	b) Outdoor type Cable Termination Kit of Suitable size.	6.00	Nos.				
	c) Indoor type Cable Termination Kit of Suitable size .	6.00	Nos.				
2	a)12 kV Power Cable (1×185 sq. mm. Copper Cable).	1,000.00	m				
	b) Outdoor type Cable Termination Kit of Suitable size .	12.00	Nos.				
	c) Indoor type Cable Termination Kit of Suitable size.	12.00	Nos.				
3	Low voltage power and control cable with all accessories complete to complete the scope of work including indoor and outdoor lighting as per specification.	1.00	Lot				
A.11	Steel Tubular Pole for Outgoing Feeder and Street Light						
1	11 m long Steel Tubular double pole with channels and accessories all complete as per specification.(For 11 kV Outgoing Feeder)	4.00	Set				
2	8m Steel Tubular Pole for Street lighting all complete as per drawing and specification.	10.00	Nos.				

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District

3. Electrical Substation and Bay Extension Works							
S. No.	Description	Qty	Unit	Unit Rate NRs.	Rate (In Words)	Amount NRs.	Remarks
A.1 2	Gantry & Equipment Support Structures:						
1	Supply of Galvanized Steel structures for Take off Gantry, Bus Bar, Post Insulator and equipment supporting frame, Lighting Mast etc., with all necessary accessories and fittings all complete as per site condition.	15.00	ton				
A.1 3	Battery and Charger						
1	110 V Battery Charger as per specification (suitable for 110 v, 240 Ah Battery).	1.00	Set				
2	240 Ah, 110 V Maintenance Free Battery as per specification.	1.00	Set				
A.1 4	Kiosk						
1	Marshalling Kiosk.	1.00	Set				
A.1 5	Miscellaneous						
1	1.5 Ton Air Conditioner.	3.00	Set				
2	50 W LED Lamp including accessories	14.00	Set				
3	SONY BRAVIA 2 II 4K Processor X1 4K Ultra HD High Dynamic Range (HDR) Smart TV (Google TV) or equivalent	1.00	Set				
Sub-Total of A - Supply and Delivery of Substation Equipment (Materials)							

UPPER ARUN HYDROELECTRIC LIMITED
(A SUBSIDIARY COMPANY OF NEA)

Bidder's Name & Address :

3. Electrical Substation and Bay Extension Works

S. No.	Description	Unit	Qty	Rate NRs.	Rate (In Words)	Amount NRs.
B.	<u>Installation, testing and commissioning of electrical equipment</u>					
B.1	Transformer					
1	33/11 kV, 6/8 MVA, 50 Hz, 3 Phase, ONAN/ ONAF, dyn11 Power Transformer with accessories all complete	2.00	Set			
2	100 kVA 33/0.4, 50 Hz, dyn11 Station Transformer including 400 V MCCB and all required installation and connection accessories all complete	1.00	Set			
B.2	33 kV Switchgear					
1	33 kV, 800 A, 20 kA, TP Vacuum Circuit Breaker with all accessories as per specification	4.00	Set			
2	33 kV, 800 Amp, 20 kA, TP, single throw Disconnecting Switch without earth switch as per specification	4.00	Set			
3	33 kV, 800 Amp, 20 kA, TP, single throw Disconnecting Switch with earth switch as per specification	2.00	Set			
B.3	Instrument Transformers					
1	33 kV oil immersed, out door type single phase Current Transformer "300 - 150 / 5 - 5 Amp" (3 Nos. in one set) as per specification	4.00	Set			
2	33 kV single phase, oil filled, out door type Potential Transformer "33000/√3/110/√3 Volt" (3 Nos. in one set) as per specification	1.00	Set			
B.4	Lighting Arrestor					
1	30 kV, 10 kA, Gapless, ZnO Lightning Arrestor (3 Nos. in one set) as per specification	4.00	Set			
2	9 kV, 10 KA Lightning Arrestor with Clamps (3 nos. in one set) as per specification [For 11k V feeder]	4.00	Set			
B.5	Control And Relay panel					
1	33 kV Control and Relay Panel of 33 kV feeder as per specification.	2.00	Set			

3. Electrical Substation and Bay Extension Works

S. No.	Description	Unit	Qty	Rate NRs.	Rate (In Words)	Amount NRs.
2	6/8 MVA Transformer Control and Relay Panel for as per specification.	2.00	Set			
3	33 kV AVR and OLTC Panel including accessories complete	2.00	Set			
B.6	Busbar and Insulator					
1	33 kV Outdoor Busbar with required insulators, Busbar, Clamps etc. including all accessories all complete as per specification	1.00	Lot			
2	33 kV Post Insulator including accessories complete as per specification.	2.00	Set			
B.7	11 kV Switchgear					
1	12 kV, 1200 A, 25 kA Vacuum Circuit Breaker with Control Panel (12 kV switchgear Panel) for incoming feeder circuit complete with all accessories as per specification.	2.00	Set			
2	12 kV, 800 A, 25 kA Vacuum Circuit Breaker with Control Panel (12 kV switchgear Panel) for outgoing feeder circuit complete with all accessories as per specification.	4.00	Set			
3	12 kV, 2000 A, 25 kA Vacuum Circuit Breaker with Control Panel (12 kV switchgear Panel) for outgoing feeder circuit complete with all accessories as per specification.	1.00	Set			
B.8	Earthing					
1	Substation Earthing and grounding works all complete as per specification.	1.00	Lot			
2	Lightning protection for substaion inclding shield wire, earthing rod, and accessories as per specification.	2.00	Set			
B.9	Station Supply					
1	400 Volt AC Distribution Board all complete with accessories as per specification.	1.00	Set			
2	110 Volt DC Distribution Board all complete with accessories as per specification.	1.00	Set			
3	600 V, PVC insulated armoured, 3.5 core, 50 sq. mm. copper cable for Station supply & Battery Charger	200.00	m			
4	33 kV Power Fuse including accessories complete set	1.00	Set			
B.10	Control and Power Cables					
1	12 kV, 1×400 sq.mm. XLPE copper cable laying works.	300.00	m			
2	12 kV, 1×185 sq.mm. XLPE copper cable laying works.	1,000.00	m			
3	Indoor and Outdoor 12 kV Cable termination kit	36.00	Nos.			

3. Electrical Substation and Bay Extension Works

S. No.	Description	Unit	Qty	Rate NRs.	Rate (In Words)	Amount NRs.
4	Laying of low voltage power and control cable and necessary equipment to complete the scope of works including indoor and outdoor lighting as per specification.	1.00	Lot			
B.11	Steel Tubular Pole For Outgoing Feeder and Street Light					
1	11 m long Steel Tubular double pole with channels and accessories all complete as per specification.(For 11kV Outgoing Feeder)	4.00	Set			
2	11m Steel Tubular Pole for Street lighting all complete as per drawing and specification.	10.00	Nos.			
B.12	Gantry & Equipment Support Structures:					
1	Galvanized Steel structures for Take off Gantry, Bus Bar, Post Insulator and equipment supporting frame etc., with all necessary accessories and fittings all complete as per site condition.	15.00	ton			
B.13	Battery and Charger					
1	110 V Battery and Battery Charger including accessories complete.	1.00	Set			
2	111 V Battery and Battery Charger including accessories complete.	1.00	Set			
B.14	Kiosk					
1	Marshalling Kiosk Box.	1.00	Set			
B.15	Miscellaneous					
1	1.5 Ton Air Conditioner.	3.00	Set			
2	50 W LED Lamp including accessories	14.00	Set			
3	SONY BRAVIA 2 II 4K Processor X1, 4K Ultra HD High Dynamic Range (HDR) Smart TV (Google TV) or equivalent	1.00	Set			
Sub-Total of B - Installation, Testing and Commissioning of Electrical equipment						

UPPER ARUN HYDROELECTRIC LIMITED
(A SUBSIDIARY COMPANY OF NEA)

Bidder's Name & Address:

3. Electrical Substation and Bay Extension Works

S. No.	Description	Unit	Qty	Unit Rate NRs.	Rate (In Words)	Amount NRs.
C.	<u>Spare parts & maintenance equipment/instruments</u>					
C.1	For 33/11 kV, 6/8 MVA Power Transformers					
1	33 kV bushing with Current Transformers	1.00	Set			
2	11 kV bushing with Current Transformers	1.00	Set			
3	Neutral bushing with Current Transformers	1.00	Set			
4	Dial type thermometer	1.00	Set			
5	Oil level gauge	1.00	Set			
6	Indicating lamps (25 % of used)	1.00	Lot			
7	All types of fuses (25 % of used)	1.00	Lot			
C.2	For 33 kV Vacuum Circuit Breakers					
1	Complete set of replacable vacuum chambers	3.00	Nos			
2	Spring Charge Motor	2.00	Set			
3	Bushing	1.00	Nos.			
4	Tripping, closing and auxilliary coils (one of each type)	4.00	Set			
C.3	For 33 kV Disconnecting Switch					
1	Porcelain Insulator	1.00	Set			
2	Main contact assemblies including grounding blades	1.00	Set			
3	Auxilliary contacts	1.00	Set			
C4	Instrument Transformers					
1	33 kV oil immersed, outdoor type single phase Current Transformer "300 - 150 / 5 - 5 Amp" as per specification (1 nos.)	1.00	Nos			
2	33 kV single phase, oil filled, out door type Potential Transformer "33000/√3/110/√3 Volt" as per specification (1 nos.)	1.00	Nos			
C.5	For 33 kV Control & Relay panel					

Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha

District

1	Fuse and Indicating lamps (200 % of used)	1.00	Lot			
2	Auxilliary relays	1.00	Lot			
3	Over current/Earth fault Relay	1.00	Set			
4	Transformer Differential Relay	2.00	Set			
C.6	For 12 kV Circuit Breakers					
1	Vacuum Intrupter	3.00	Nos.			
2	Tripping, closing and auxilliary coils	4.00	Set			
3	Fuse & Indicating lamps (200 % of used)	1.00	Lot			
4	Spring Charge Motor	2.00	Set			
5	OverCurrent/Earth fault Relay	1.00	Set			
6	Current Transformer(For Incommer Feeder)	1.00	No.			
7	Current Transformer (For Outgoing Feeder)	1.00	No.			
8	11 KV Potential Transformer	1.00	Set			
C.7	Lightning arrestor					
1	30 kV, 10 kA lightning arrestor including discharge counter for cable protection complete with all accessories as per specification	3.00	Nos.			
C.8	Maintenance Equipment/ Instruments					
1	Digital Multimeter (AC and DC)	1.00	No.			
3	Tool box with sspaner set, screw driver set and plier set	1.00	Set			
4	Chain block set, 5 ton capacity	1.00	No.			
5	Wire pulling device, 2 Ton capacity with tongue suitable for WOLF conductor	1.00	No.			
6	11 kV operating rod	1.00	No.			
7	Analog Multimeter (AC and DC)	1.00	No.			
8	LapTop with 14th Gen Intel Core Ultra 7 155H Processor or equivalent	4.00	No.			
9	5000V Battery Operated Megger	1.00	No.			
Sub-Total of C-Spare parts & Maintenance Equipment/Instruments						

UPPER ARUN HYDROELECTRIC LIMITED
(A SUBSIDIARY COMPANY OF NEA)

Bidder's Name & Address:

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
A.	SUBSTATION						
A.1	Civil Works of Switchyard and Cable trench - as per technical specifications and approved design/drawings						
1	Earthwork Excavation by means of mechanical in all types of soil (soil/gravel/ BMS) as per drawing and technical specifications including removal of stumps and other deleterious matter, all lifts and lead as per drawing and instruction of the engineer.	cu.m	230.00				
2	Earthwork excavation in hard rock using hydraulic excavation (capacity 0.8 m3) all complete as per instruction by site engineer.	cu.m	200.64				
3	Providing and laying of reinforced cement concrete (PCC Work) M10 in foundation all complete as per drawing and technical specifications.	cu.m	23.73				
4	Providing and laying of reinforced cement concrete M20 RCC work all complete as per drawing and technical specifications.	cum	167.08				
5	Providing and laying MS Reinforcement including cutting, bending, binding, fixing in position etc. all complete as per drawing and specification.	ton	18.38				
6	Providing, preparing and installation of form work including necessary supports and removing after completion for structure according to technical specifications and drawings and hauling up to 30 m distance.	sq.m	808.06				
7	Back filling in layers in foundation pits, trenches, etc, including compaction all complete with watering	cu.m	413.27				
8	Supply and fixing of cable holding Galvanized M.S. angle bracket as per drawing and technical specifications	m	77.10				
9	Chain link fencing as per technical specification and approved drawing but excluding concrete which shall be paid seperately	rm	75.00				
10	Switch yard Gate with complete finish as per drawing and technical specifications	Nos.	1.00				

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
11	Stone filling work in Power transformer foundation as per drawings & technical specifications	cu.m	36.50				
12	40mm Gravel spreading including antiweed treatment in switchyard but excluding PCC as per drawings and technical specifications	cu.m	89.06				
13	Providing and laying 75mm thick Plain Cement Concrete 1:5:10 (1 cement : 5 sand : 10 Stone aggregate) as per drawings and technical specifications	cu.m	46.14				
A.2	Landscaping Works						
A.2.1	Site Levelling						
1	Earth work in cutting including site clearing work as per instruction of the Engineer	cu.m	2,500.00				
A.2.2	Boundary cum RCC Retaining Wall						
1	Earthwork Excavation by means of mechanical in all types of soil (soil/gravel/BMS) as per drawing and technical specifications including removal of stumps and other deleterious matter, all lifts and lead as per drawing and instruction of the engineer.	cu.m	1,356.50				
2	Earthwork in backfilling as per instruction of the Engineer	cu.m	542.60				
3	Stone soling and finishing upto approved level, line and dimension as per instruction of the Engineer	cu.m	117.00				
4	Providing and laying of reinforced cement concrete (PCC Work) M10 in foundation complete as per drawing and technical specifications.	cu.m	117.00				
5	Providing and laying of reinforced cement concrete M20 RCC work in complete as per drawing and technical specifications.	cum	61.60				
6	Providing and laying MS Reinforcement including cutting, bending, binding, fixing in position etc. all complete as per technical specification and drawing.	ton	6.78				
7	Providing and laying Random rubble masonry in 1:4 cement mortar including scaffolding, curing, preparation of mortar, Cement pointing (1:2), Upvc pipe & Geotextile etc. complete, masoned height 0-5m, lead 30m all complete as per drawings & technical specification	cu.m	750.00				

District

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
8	Providing, preparing and installation of form work including necessary supports and removing after completion for structure according to technical specifications and instruction of the Engineer and hauling up to 30 m distance.	sq.m	350.60				
9	Chain link fencing as per technical specification and approved drawing but excluding concrete which shall be paid seperately	rm	285.00				
10	Gabion Structure for Retaining Earth, Providing and laying Gabion structure for retaining earth with diaphragm including rolling, cutting, weaving, placing, laying sides and diaphragms with binding wire and filling boulders all complete as per drawing and technical specification. Mesh wire- 10 Swg(0.0615 kg/m), Seldedge Wire 8 Swg (/m), binding wire 12 Swg (0.0409 kg/m) Hexagonal mesh	cu.m	960.00				
A.2.3	Main Entrance Gate						
1	Earthwork in Excavation of all types of soil by mechanical means as per drawing and technical specifications including removal of trees,grasses,stumps and other deleterious matter, all lifts and lead as per drawing and instruction of the engineer.	cu.m	12.38				
2	Stone soling and finishing upto approved level, line and dimension as per instruction of the Engineer	cu.m	1.24				
3	Providing and laying of plain cement concrete M10 in foundation complete as per drawing and technical specifications.	cu.m	0.62				
4	Providing and laying of reinforced cement concrete M20 RCC work in complete as per drawing and technical specifications.	cu.m	4.73				
5	Providing and laying Reinforcement including cutting, bending, binding, fixing in position etc. all complete as per drawing and technical specification.	ton	0.52				
6	Providing, preparing and installation of form work including necessary supports and removing after completion for structure according to technical specifications and instruction of the Engineer and hauling up to 30 m distance.	sq.m	25.61				
7	Providing, and installation all complete of metal gate as per TS and drawings	nos.	1.00				



District

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
A.3	Control Building works						
A.3.1	Earthworks						
1	Earthwork in Excavation of all types of soil by mechanical means as per drawing and technical specifications including removal of trees,grasses,stumps and other deleterious matter, all lifts and lead as per drawing and instruction of the engineer.	cum	146.65				
2	Back filling in layers in foundation pits, trenches , etc, with approved soil obtained from the excavation at site and stacked at site or brought from outside in layer including compaction all complete with watering as per technical specifications and instruction of the Engineer.	cum	164.66				
A.3.2	Concrete Works						
1	Providing and laying of plain/reinforced cement concrete M110 (machine mixed) in foundation complete as per drawing and technical specifications.	cum	31.33				
2	Providing and laying of reinforced cement concrete M20 RCC work in complete as per drawing and technical specifications.	cum	76.60				
3	Providing and laying Reinforcement including cutting, bending, binding, fixing in position etc. all complete as per technical specification and drawing.	ton	8.43				
4	Providing, preparing and installation of form work including necessary supports and removing after completion for structure according to technical specification and instruction of the Engineer and hauling up to 30 m distance.	sqm	623.40				
A.3.3	Stone/Brick Works						
1	Stone soling and finishing upto approved level, line and dimension as per instruction of the Engineer	cum	47.41				
2	Providing & laying First class chimney made brick masonry work in sub-structure with 1:6 cement sand mortar including lead upto 30 m with curing, cleaning & racking out mortar joint and making ducts, recesses where required as per drawing and instruction of the Engineer	cum	28.39				

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
3	Providing & laying First class chimney made brick masonry work in Superstructure with 1:6 cement sand mortar including lead upto 30 m with curing, cleaning & racking out mortar joint and making ducts, recesses where required as per drawing and instruction of the Engineer	cum	45.39				
A.3.4	Finishing Works						
1	2mm thick white putty on internal wall and ceiling all complete as per technical specification and drawings.	sqm	561.60				
2	Two coat plastic emulsion paint over one coat primer on new surface as per technical specification and drawings.	sqm	561.60				
3	Two coat of weather coating over one coat primer (Astar) on new surface as per technical specification and drawings.	sqm	179.42				
4	Providing, fabricating & fixing UPVC doors including frame and shutter using UPVC section with steel handle, tower bolt, hinges, lock system, screws etc and all necessary accessories, complete as per drawings and technical specification.	sqm	23.37				
5	Providing, fabricating & fixing Windows and ventilation of Upvc frame using Upvc section with 5mm clear float glass, U-shaped both side plastic gasket, steel hook locks and screws all accessories as per drawing all complete.((frame 60*60mm, sash 60*78mm, white colour with 5mm glass)	sqm	26.75				
6	3 x 20mm Metal Grill for Window including manufacturing, fitting, painting with Aluminium paint, sand papering all complete	kg	530.00				
7	Providing, laying, compacting and curing average 38mm mm thick screed with 1:2:4 cement sand mortar in perfect lines & level in whole flooring as per design, specification and instruction of the site engineer.	sqm	150.60				
8	Provide and laying 3 mm cement punning including cleaning, watering, curing the laid surface all complete as per instruction & specification.	sqm	211.40				
9	Providing Glazed Ceramic Tile on walls of approved size and colour with 1:4 cement sand mortar.	sqm	39.05				
10	Providing and fixing non glazed ceramic tiles fixed on floors with 1 : 4 Cement Sand Mortar in exact line & level all complete as per drawing specification & instruction.	sqm	22.28				

District

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
11	Providing, laying & curing cement sand (1:4) Plastering on Ceiling & internal walls 12.5mm to perfect plumb, lines & level including raking the mortar joints and wetting the masonry surface all complete as per design drawings, specifications and instruction of the site engineer all complete:	sqm	625.37				
12	Providing, laying & curing cement sand (1:4) Plastering 20mm on external walls to perfect plumb, lines & level including raking the mortar joints and wetting the masonry surface all complete as per design drawings, specifications and instruction of the site engineer all complete:	sqm	173.28				
13	Providing and application of two coats of water-proofing coating on the RCC Terrace, shear wall, Slope Roof, Sun-shade Slab etc. with ordinary hand brush including cleaning of the surface all complete as per drawings & specification	sqm	192.00				
A.3.5	Miscellaneous Works						
1	Providing and fixing of rolling shutters as per specifications all complete.	sqm	9.66				
2	Fire Extinguisher (6Kg NS or IS standard) with range of jet 6 m	no	1.00				
3	Euroguard 7 Liters/min (max) wall mounted with water flow rate 0.25 L/min and purification capacity upto 15L/hr	no	1.00				
4	supply and fixing of Electrification Work: indoor lighting fixtures including internal wiring, lighting panels and accessories all complete as per drawing, specification and as directed by site engineer.	LS	1.00				
5	Plumbing, sanitation and related works including water faucets, valves, pipe, fittings, PVC 1000 Litre Overhead, RCC underground water tank etc Tank, Pumps, and all applicable fittings all complete	LS	1.00				
6	Construction of septic tank and soak pit for toilet/bathroom disposal as per drawing & Specification as directed by site engineer	LS	1.00				
A.4	Guard House Building works						
A.4.1	Earthworks						
1	Earthwork in Excavation of all types of soil by manual means as per drawing and technical specifications including removal of trees, grasses, stumps and other deleterious matter, all lifts and lead as per drawing and instruction of the engineer.	cum	19.75				

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
2	Back filling in layers in foundation pits, trenches , etc, with approved soil obtained from the excavation at site and stacked at site or brought from outside in layer including compaction all complete with watering	cum	11.14				
A.4.2	Concrete Works						
1	Providing and laying of plain/reinforced cement concrete M10 (machine mixed) in foundation complete as per drawing and technical specifications.	cum	4.39				
2	Providing and laying of reinforced cement concrete M20 RCC work in complete as per drawing and technical specifications.	cum	9.94				
3	Providing and laying Reinforcement including cutting, bending, binding, fixing in position etc. all complete as per specification and drawing.	ton	1.09				
4	Providing, preparing and installation of form work including necessary supports and removing after completion for structure according to drawings and hauling up to 30 m distance.	sqm	75.64				
A.4.3	Stone/Brick Works						
1	Stone soling and finishing upto approved level, line and dimension	cum	6.40				
2	Providing & laying First class chimney made brick masonry work in sub-structure with 1:6 cement sand mortar including lead upto 30 m with curing, cleaning & racking out mortar joint and making ducts, recesses where required as per drawing	cum	5.10				
3	Providing & laying First class chimney made brick masonry work in Superstructure with 1:6 cement sand mortar including lead upto 30 m with curing, cleaning & racking out mortar joint and making ducts, recesses where required as per drawing	cum	6.57				
A.4.4	Finishing Works						
1	2mm thick white putty on internal wall and ceiling all complete as per specification and drawing.	sqm	50.03				
2	Two coat plastic emulsion paint over one coat primer on new surface as per specification and drawing.	sqm	50.03				
3	Two coat of weather coating over one coat primer (Astar) on new surface as per specification and drawing.	sqm	39.04				

District

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
4	Providing, fabricating & fixing UPVC doors including frame and shutter using UPVC section with steel handle, tower bolt, hinges, lock system, screws etc and all necessary accessories, complete as per drawing and specification.	sqm	2.21				
5	Providing, fabricating & fixing Windows and ventilation of Upvc frame using Upvc section with 5mm clear float glass, U-shaped both side plastic gasket, steel hook locks and screws all accessories as per drawing all complete.((frame 60*60mm, sash 60*78mm, white colour with 5mm glass)	sqm	2.36				
6	3 x 20mm Metal Grill for Window including manufacturing, fitting, painting with Aluminium paint, sand papering all complete	kg	47.25				
7	Providing, laying, compacting and curing average 38mm mm thick screed with 1:2:4 cement sand mortar in perfect lines & level in whole flooring as per design, specification and instruction of the site engineer.	sqm	9.45				
8	Provide and laying 3 mm cement punning including cleaning, watering, curing the laid surface all complete as per instruction & specification.	sqm	53.84				
9	Providing, laying & curing cement sand (1:4) Plastering on ceiling & internal walls 12.5mm to perfect plumb, lines & level including raking the mortar joints and wetting the masonry surface all complete as per design drawings, specifications and instruction of the site engineer all complete:	sqm	62.37				
10	Providing, laying & curing cement sand (1:4) Plastering 20mm on external walls to perfect plumb, lines & level including raking the mortar joints and wetting the masonry surface all complete as per design drawings, specifications and instruction of the site engineer all complete:	sqm	41.56				
11	Providing and application of two coats of water-proofing coating on the RCC Terrace, shear wall, Slope Roof, Sun-shade Slab etc. with ordinary hand brush including cleaning of the surface all complete as per drawings & specification	sqm	16.80				
A.5	Roads and Drainage						
A.5.1	Internal Roads						



District

4: Civil Construction works

Item	Description	Unit	Quantity	Unit Rate NRs.	Rate (In Words)	Total Amount	Remarks
1	Earthwork in Excavation of all types of soil by mechanical means as per drawing and technical specifications including removal of trees,grasses,stumps and other deleterious matter, all lifts and lead as per drawing and instruction of the engineer.	cu.m	75.00				
2	Providing and laying of hand pack stone soling and packing with smaller stones on prepared surface as per drawing and technical specifications	cu.m	45.00				
3	Providing and laying of reinforced cement concrete M20 RCC work in complete as per drawing and technical specifications.	cu.m	45.00				
4	Providing and laying Reinforcement including cutting, bending, binding, fixing in position etc. all complete as per specification and drawing.	ton	4.95				
A.5.2	Drainage						
1	Earthwork in Excavation of all types of soil by mechanical means as per drawing and technical specifications including removal of trees,grasses,stumps and other deleterious matter, all lifts and lead as per drawing and instruction of the engineer.	cu.m	130.63				
2	Stone soling and finishing upto approved level, line and dimension	cu.m	24.75				
3	Supplying mixing, placing, compacting of 100mm thick M10 plain cement concrete for foundation bases & floors lead upto 30m excluding the cost of formwork & reinforcement bars, as per drawing, specification & instruction all complete.	cu.m	20.63				
4	Providing & laying Stone masonry work with 1:4 cement sand mortar (1 cement : 4 sand) including lead upto 30 m with curing, cleaning & racking out mortar joint and making ducts, recesses where required as per drawing	cu.m	78.75				
5	Providing and laying of 600mm dia hume pipe for drainage at road crossings as per specification and requirement at site, NP3	rm	25.00				
6	Supplying and Erecting Dewatering Pumps - 0.5 HP or of required capacity	nos.	1.00				
				Total of A5			
				Total of (A1+A2+A3+A4+A5)			

Date :
Place :

Signature :
Printed Name :
Designation :
Common Seal :



[Handwritten signature]

Part III: CONDITIONS OF CONTRACT AND CONTRACT FORMS

Table of Clauses

A. General	595
1. Definitions.....	595
2. Interpretation.....	596
3. Language and Law	597
4. Contract Agreement.....	597
5. Assignment	597
6. Care and Supply of Documents	597
7. Confidential Details	598
8. Compliance with Laws	598
9. Joint and Several Liability	598
10. Project Manager's Decisions	598
11. Delegation.....	598
12. Communications	599
13. Subcontracting.....	599
14. Other Contractors	599
15 Personnel and Equipment	599
16. Employer's and Contractor's Risk.....	599
17. Employer's Risks	599
18. Contractor's Risks	600
19. Insurance	600
20. Site Investigation Reports	600
21. Contractor to Construct the Works.....	600
22. The Works to Be Completed within intended Completion Date	601
23. Design by contractor and Approval by the Project Manager	601
24. Safety, Security and Protection of the Environment.....	601
25. Discoveries.....	601
26. Possession of the Site	602
27. Access to the Site	602
28. Instructions, Inspections and Audits	602
29. Dispute Settlement.....	602
30. Procedures for Disputes	602
B. Staff and Labor	602
31. Forced Labor	602
32. Child Labor	602
33. Nondiscrimination and Equal Opportunity	603
B. Time Control	603

34. Program.....	603
35. Extension of the Intended Completion Date	603
36. Acceleration	604
37. Delays Ordered by the Project Manager.....	604
38. Management Meetings.....	604
39. Early Warning	604
C. Quality Control	604
40. Identifying Defects.....	604
41. Tests	604
42. Correction of Defects	604
43. Uncorrected Defects.....	605
D. Cost Control	605
44. Contract Price	605
45. Changes in the Contract Price	605
46. Variations.....	605
47. Cash Flow Forecasts	606
48. Payment Certificates.....	606
49. Payments	606
50. Compensation Events.....	607
51. Tax.....	607
52. Currency.....	608
53. Price Adjustment	608
54. Retention.....	609
55. Liquidated Damages	610
56. Bonus	610
57. Advance Payment.....	610
58. Securities.....	611
59. Dayworks	611
60. Cost of Repairs.....	611
F. Force Majeure	611
61. Definition of Force Majeure	611
62. Notice of Force Majeure.....	612
63. Duty to Minimize Delay	612
64. Consequences of Force Majeure	612
65. Force Majeure Affecting Subcontractor	613
66. Optional Termination, Payment and Release.....	613

67. Release from Performance.....	613
G. Finishing the Contract.....	614
68. Completion	614
69. Taking Over.....	614
70. Final Account	614
71. Operating and Maintenance Manuals	615
72. Termination	615
73. Fraud and Corruption	616
74. Black Listing	616
75. Payment upon Termination.....	617
76. Property.....	617
77. Release from Performance.....	617
78. Suspension of DP Loan/Credit/Grant.....	617
79. Eligibility	617
80. Project Manager's Duties and Authorities	618
81. Quarries and Spoil Dumps.....	618
82. Local Taxation.....	618
83. Value Added Tax	618
84. Income Taxes on Staff.....	618
85. Duties, Taxes and Royalties.....	618
86. Member of Government, etc, not Personally Liable.....	619
87. Approval of Use of Explosives	619
89. Permission for Blasting	619
90. Records of Explosives.....	619
91. Traffic Diversion	619

Section VIII: General Conditions of Contract

**Tender No.: UAHEL/082/83/SS-01: Design, Supply, Installation, Testing and Commissioning of 33/11 kV,
6/8 MVA Gola Bazar Substation at Sankhuwasabha District**



General Conditions of Contract

This Section provides the General Conditions of Contract that will apply to the Contract for which the Bidding document is issued.

A. General	
1. Definitions	1.1 Boldface type is used to identify defined terms. (a) The Accepted Contract Amount means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects. (b) The Activity Schedule is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events. (c) Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid. (d) Compensation Events are those defined in GCC 50 hereunder. (e) The Completion Date is the date of completion of the Works as certified by the Project Manager, in accordance with GCC 68.1. (f) The Contract is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC 2.3 below. (g) The Contractor is the party whose Bid to carry out the Works has been accepted by the Employer. (h) The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer. (i) The Contract Price is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract. (j) Days are calendar days; months are calendar-months. (k) Dayworks are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant. (l) A Defect is any part of the Works not completed in accordance with the Contract. (m) The Defects Liability Certificate is the certificate issued by Project Manager upon correction of defects by the Contractor. (n) The Defects Liability Period is the period calculated from the Completion Date where the Contractor remains responsible for remedying defects. (o) Drawings include calculations and other information provided or approved by the Project Manager for the execution of the Contract. (p) The Employer is the party who employs the Contractor to carry out the Works, as specified in the SCC. (q) Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works. (r) Force Majeure means an exceptional event or circumstance: which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially

	attributable to the other Party. (s) The Initial Contract Price is the Contract Price listed in the Employer's Letter of Acceptance. (t) In writing or written means hand written, type written, printed or electronically made, and resulting in permanent record. (u) The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the SCC. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order. (v) Letter of Acceptance means the formal acceptance by the Employer of the Bid and denotes the formation of the contract at the date of acceptance. (w) Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works. (x) Party means the Employer or the Contractor, as the context requires. (y) SCC means Special Conditions of Contract (aa) Plant is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function. (bb) The Project Manager is the person named in the SCC (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract. (cc) Retention Money means the aggregate of all monies retained by the Employer pursuant to GCC 54.1. (dd) Schedules means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Bids, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices. (ee) The Site is the area defined as such in the SCC (ff) Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site. (gg) Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager. (hh) The Start Date is given in the SCC. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates. (ii) A Subcontractor is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site. (jj) Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works. (kk) A Variation is an instruction given by the Project Manager which varies the Works. (ll) The Works are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the SCC.
2. Interpretation	2.1 In interpreting these GCC, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.

	2.2 If sectional completion is specified in the SCC, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works). 2.3 The documents forming the Contract shall be interpreted in the following order of priority: (a) Contract Agreement, (b) Letter of Acceptance, (c) Letters of Technical Bid and Price Bid, (d) Special Conditions of Contract, (e) General Conditions of Contract, (f) Specifications, (g) Drawings, (h) Bill of Quantities (or Schedules of Prices for lump sum contracts), and (i) Any other document listed in the SCC as forming part of the Contract.
3. Language and Law	3.1 The language of the Contract and the law governing the Contract are stated in the SCC. a. Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Employer's country when (a) 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 Employer's Country prohibits any import of goods from, or any payments to, a particular country, person, or entity. Where the employer's country prohibits payments to a particular firm or for particular goods by such an act of compliance, that firm may be excluded.
4. Contract Agreement	4.1 The Parties shall enter into a Contract Agreement within 15 days after the Contractor receives the Letter of Acceptance, unless the Special Conditions establish otherwise. The Contract Agreement shall be based upon the attached Contract forms in Section X. 4.2 Without altering the basic nature or scope of work, the contract may be amended upon mutual written consent as per prevailing Public Procurement Law.
5. Assignment	5.1 Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party (a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party; and (b) may, as security in favor of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.
6. Care and Supply of Documents	6.1 The Specification and Drawings shall be in the custody and care of the Employer. Unless otherwise stated in the Contract, one copy of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor. 6.2 Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated

	in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents. 6.3 The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times. 6.4 If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.
7. Confidential Details	7.1 The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify the Contractor's compliance with the Contract and allow its proper implementation. 7.2 Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects. 7.3 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 Clause.
8. Compliance with Laws	8.1 The Contractor shall, in performing the Contract, comply with applicable Laws of Nepal.
9. Joint and Several Liability	9.1 If the Contractor is a joint venture of two or more entities, all such entities shall be jointly and severally liable 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 joint venture. The contractor shall not handover the responsibility of the contract to any one member or some members of Joint Venture or any other parties, not involved in the contract. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.
10. Project Manager's Decisions	10.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.
11. Delegation	11.1 The Project Manager may delegate any of his duties and responsibilities to other people after notifying the Contractor, and may cancel any delegation after notifying the Contractor.
12. Communications	12.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices and requests, these communications shall be:

	(a) in writing and delivered by hand (against receipt), sent by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the SCC; and (b) delivered, sent or transmitted to the address for the recipient's communications as stated in the Contract. However: (i) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and (ii) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued. Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed.
13. Subcontracting	12.2 A Notice shall be effective when delivered or on the Notice's effective date, whichever is later. For GON Funded: 13.1 A list of approved Subcontractors including its value/works is included as Article 2 (k) of Contract Agreement 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. 13.2 The contractor shall give prior notice to the Employer clearly specifying the nature, scope, and responsibilities of the work to be performed, to engage other subcontractors, material suppliers, equipment suppliers, service providers, or other persons or entities during the implementation of the contract. 13.3 Before notifying the Employer as per GCC 13.2, the contractor shall enter into a written agreement with the subcontractors, material suppliers, equipment suppliers, service providers, or other persons or entities clearly specifying the scope of work, responsibilities, quality requirements, duration, payment terms, security, labor-related obligations, and conditions relating to performance of the work. 13.4 Any subcontracting arrangement made in accordance with GCC 13.2 shall not relieve the Contractor of any of its obligations or liabilities under the Contract. 13.5 The contractor shall provide the Employer with details of the payments made to the subcontractors, material suppliers, equipment suppliers, service providers, or other persons or entities engaged under GCC 13.1 and/or GCC 13.2. 13.6 If the contractor is found not to have made payment to the subcontractor, material suppliers, equipment suppliers, service providers, or other persons or entities engaged under GCC 13.1 and/or GCC 13.2 in accordance with the terms of the agreement, the Employer may determine the amount payable to such subcontractor, material suppliers, equipment suppliers, service providers, or other persons or entities and make payment to them from any remaining dues to be paid to the contractor, retention money, or forfeited performance security. For DP Funded: The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations. Bidders may propose subcontracting up to the percentage of total value of contracts as specified in the SCC. The Sub contractor shall meet the qualification requirement as specified in SCC.

14. Other Contractors	14.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as referred to in the SCC . The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification
15 Personnel and Equipment	15.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid to carry out the Works, or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid. 15.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract. 15.3 If the Employer, Project Manager, or Contractor determines, that any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or other prohibited practices during the execution of the Works, then that employee shall be removed in accordance with Clause 15.2 above.
16. Employer's and Contractor's Risk	16.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.
17. Employer's Risks	17.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks: (a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to (i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works or (ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor. (b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed. 17.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to (a) a Defect which existed on the Completion Date, (b) an event occurring before the Completion Date, which was not itself an Employer's risk, or (c) the activities of the Contractor on the Site after the Completion Date.

18. Contractor's Risks	18.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks are Contractor's risks.
19. Insurance	19.1 The Contractor shall provide insurance in the joint names of the Employer and the Contractor from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the SCC for the following events which are due to the Contractor's risks: (a) loss of or damage to the Works, Plant, and Materials; (b) loss of or damage to Equipment; (c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and (d) Personal injury or death. 19.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the proportions of Nepalese Rupees required to rectify the loss or damage incurred. 19.3 If the Contractor does not provide any of the policies and certificates required, the Employer may affect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due. 19.4 Alterations to the terms of insurance shall not be made without the approval of the Project Manager. 19.5 Both parties shall comply with any conditions of the insurance policies.
20. Site Investigation Reports	20.1 The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the SCC , supplemented by any information available to the Contractor.
21. Contractor to Construct the Works	21.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.
22. The Works to Be Completed within intended Completion Date	22.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them within the intended Completion Date.
23. Design by contractor	23.1 The contractor shall be responsible for the design of permanent works as specified in SCC .

and Approval by the Project Manager	23.2 Contractor shall be responsible for design of the Temporary Works. The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, for his approval.
	23.3 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, shall be subject to prior approval by the Project Manager before their use.
	23.4 The Project Manager's approval shall not alter the Contractor's responsibility for design of temporary works.
24. Safety, Security and Protection of the Environment	24.1 The Contractor shall, throughout the execution, and completion of the works and remedying of any defects therein: a. Have full regard for the safety of all persons entitled to be upon the site and keep the site (so as the same is under his control) and the works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons. b. Provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when necessary or required by the Project Manager or by any duly constituted authority, for the protection of the Works of for the safety and convenience of the public or others. c. Take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. d. Ensure that any cut or fill slopes are planted in grass or other plant cover as soon as possible to protect them from erosion. e. Any spoil or material removed from drains shall be disposed of to designated stable tipping areas as directed by the Project Manager. f. Shall not use fuel wood as a means of heating during the processing or preparation of any materials forming part of the works. g. The Project Manager shall have the power to disallow any working practice or activity of the Contractor or direct that such practices or activities be modified should the Project Manager consider, on the advice of the relevant Government Departments, that the practices or activities will be harmful to wildlife. h. Provide on the Site such lifesaving apparatus as may be appropriate and an adequate and easily accessible first aid outfit or such outfits as may be required by any government ordinance, factory act, etc., subsequently published and amended from time to time.
	24.2 The Contractor shall comply with the Employer's Occupational Health and Safety (OHS) Policy, Guideline and/or Operating Manual, if any, as specified in the SCC.
25. Discoveries	25.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.
26. Possession of the Site	26.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the SCC , the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a

	Compensation Event.
27. Access to the Site	27.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.
28. Instructions, Inspections and Audits	28.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.
	28.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and sub consultants to keep accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.
	28.3 The Contractor shall permit the GoN/DP and/or persons appointed by the GoN/DP to inspect the Site and/or the accounts and records of the Contractor and its sub-contractors relating to the performance of the Contract, and to have such accounts and records audited by auditors appointed by the GoN/DP if required by the GoN/DP. The Contractor's attention is drawn to Sub-Clause 73.2 which provides, inter alia, that acts intended to materially impede the exercise of the GoN's/DP's inspection and audit rights provided for under this Sub-Clause constitute a obstructive practice subject to contract termination.
29. Dispute Settlement	29.1 The Employer and the Contractor shall attempt to settle amicably by direct negotiation any disagreement or dispute arising between them under or in connection with the Contract.
	29.2 Any dispute between the Parties as to matters arising pursuant to this Contract which cannot be settled amicably within thirty (30) days after receipt by one Party of the other Party 's request for such amicable settlement may be referred to Arbitration within 30 days after the expiration of amicable settlement period.
30. Procedures for Disputes	30.1 In case of arbitration, the arbitration shall be conducted in accordance with the arbitration procedures in accordance with law of Nepal at the place within the territory of Nepal given in the SCC.
B1. Staff and Labor	
31. Forced Labor	31.1 The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor–contracting arrangements.
32. Child Labor	32.1 The Contractor shall not employ children in a manner that is economically exploitative, or 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. Where national laws have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.
33. Non-discrimination and Equal Opportunity	33.1 The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries

	where national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on nondiscrimination in employment, the Contractor shall meet this Sub clause's requirements. 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.
B. Time Control	
34. Program	34.1 Within the time stated in the SCC, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule.
	34.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.
	34.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the SCC. If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the SCC from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall Provide an updated Activity Schedule within 15 days of being instructed to by the Project Manager.
	34.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.
35. Extension of the Intended Completion Date	35.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.
	35.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information at least 21 days prior to the intended completion date. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date. Along with full supporting information, the contractor shall also submit a revised work schedule and ensure that the Performance Security, Insurance, and Advance Payment Security (if any) remain valid. The contractor shall submit Performance Security, Advanced Payment Guarantee (if any) and Insurance Policy documents, as required with extended validity, within seven (7) days of receiving the Letter of Extension of Intended Completion Date from the Employer.
36. Acceleration	36.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving

	the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor. 36.2 If the Contractor's priced proposals for acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.
37. Delays Ordered by the Project Manager	37.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.
38. Management Meetings	38.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure. 38.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.
39. Early Warning	39.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible. 39.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.
C. Quality Control	
40. Identifying Defects	40.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.
41. Tests	41.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.
42. Correction of Defects	42.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at issuance of taking over certificate pursuant to GCC clause 69.2, and is defined in the SCC. The Defects Liability Period shall be extended for as long as Defects remain to be corrected. 42.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

43. Uncorrected Defects	43.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.
D. Cost Control	
44. Contract Price	44.1 In the case of a Unit Rate contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.
	44.2 In the case of a lump sum contract, the Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for Materials on Site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.
45. Changes in the Contract Price	45.1 In the case of an Unit Rate contract: (a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 2 percent of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change. (b) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.
	45.2 In the case of a lump sum contract, the Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.
46. Variations	46.1 All Variations shall be included in updated Programs, and, in the case of a lump sum contract, also in the Activity Schedule, produced by the Contractor.
	46.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.
	46.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.
	46.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.
	46.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.
	46.6 In the case of an Unit Rate contract, if the work in the Variation corresponds to an

	item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC 45.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.
47. Cash Flow Forecasts	47.1 When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast.
48. Payment Certificates	48.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.
	48.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor within 30 days of submission by contractor.
	48.3 The value of work executed shall be determined by the Project Manager.
	48.4 The value of work executed shall comprise: (a) In the case of a Unit Rate contract, the value of the quantities of work in the Bill of Quantities that have been completed; or (b) In the case of a lump sum contract, the value of work executed shall comprise the value of completed activities in the Activity Schedule.
	48.5 The value of work executed shall include the valuation of Variations and Compensation Events.
	48.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.
49. Payments	49.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 30 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest as indicated in the SCC on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made.
	49.2 If an amount certified is increased in a later certificate or as a result of an award by an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.
	49.3 Items of the Works for which no rate or price has been entered in BOQ shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.
	50.1 The following shall be Compensation Events: (a) The Employer does not give access to a part of the Site by the Site Possession

50. Compensation Events	Date pursuant to GCC 26.1. (b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract. (c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time. (d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects. (e) The Project Manager unreasonably does not approve a subcontract to be let. (f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site. (g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons. (h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor. (i) The advance payment is delayed. (j) The effects on the Contractor of any of the Employer's Risks. (k) The Project Manager unreasonably delays issuing a Certificate of Completion. 50.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended. 50.3 As soon as information demonstrating effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event. 50.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.
51. Tax	51.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 30 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC 53.
52. Currency	52.1 The currency of Contracts shall be Nepalese Rupees.
	53.1 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the SCC. If so provided, the amounts certified in each payment certificate, before

53. Price Adjustment	deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due.
	53.2 Adjustment Formulae ⁷ : The formulae will be of the following general type:
	$pn = A + b \frac{Ln}{Lo} + c \frac{Mn}{Mo} + d \frac{En}{Eo} + etc.$
	Where: <i>pn</i> is a price adjustment factor to be applied to the amount for the payment of the work carried out in the subject month, determined in accordance with Clause 49; <i>A</i> is a constant, specified in the Bidding Forms- Table of Price Adjustment data, representing the nonadjustable portion in contractual payments;⁸ <i>b</i>, <i>c</i>, <i>d</i>, etc., coefficients representing the estimated proportion of each cost element (labor, materials, equipment usage, etc.) in the Works or sections thereof, net of Provisional Sums, as specified in the SCC; <i>Ln</i>, <i>Mn</i>, <i>En</i>, etc., are the current cost indices or reference prices of the cost elements for month “n,” determined pursuant to Sub-Clause 53.4, applicable to each cost element; and <i>Lo</i>, <i>Mo</i>, <i>Eo</i>, etc., are the base cost indices or reference prices corresponding to the above cost elements at the date specified in Sub-Clause 53.4.
	53.3 Sources of Indices and Weightings: The sources of indices shall be those listed in the Bidding Forms- Table of Price Adjustment data, as approved by the Project Manager and stated in SCC. Indices shall be appropriate for their purpose and shall relate to the Contractor’s proposed source of supply of inputs on the basis of which his Contract shall have been computed. As the proposed basis for price adjustment, the Contractor shall have submitted with his bid the tabulation of Weightings and Source of Indices in the Bidding Forms, which shall be subject to approval by the Project Manager.
	53.4 Base, Current and Provisional Indices: The base cost indices or prices shall be those prevailing on the day 30 days prior to the latest date for submission of bids. Current indices or prices shall be those prevailing on the day 30 days prior to the last day of the period to which a particular Interim Payment Certificate is related. If at any time the current indices are not available, provisional indices as determined by the Project Manager will be used, subject to subsequent correction of the amounts paid to the Contractor when the current indices become available.
	53.5 Weightings: The weightings for each of the factors of cost given in the Bidding Forms shall be adjusted if, in the opinion of the Project Manager, they have been rendered unreasonable, unbalanced or inapplicable as a result of varied or additional work already executed or instructed under Clause 46 or for any other reason.
	53.6 Where, price adjustment provision is not applicable pursuant to Sub-clause 53.1 then

⁷ For complex Works involving several types of construction work with different inputs, a family of Formulae will be necessary. The various items of Day work may also require different formulae, depending on the nature and source of the inputs

⁸ Insert a figure for factor A only where there is a part of the Contractors’ expenditures which will not be subject to fluctuation in cost or to compensate for the unreliability of some indices. A should normally be 0.15. The sum of A, b, c, d, etc., should be one.

	the Contract is subject to price adjustment only for construction material in accordance with this clause. If the prices of the construction materials stated in the contract is increased or decreased in an unexpected manner in excess of ten (10%) percent in comparison to the base price construction material stated in Section –IV, Bidding Forms-Table of Price Adjustment Data, then the price adjustment for the increase or decrease of price of the construction material beyond 10% shall be made by applying the following formulas: For unexpected increase in price $P = [R_1 - (R_0 \times 1.10)] \times Q$ For unexpected decrease in price P $= [R_1 - (R_0 \times 0.90)] \times Q$ Where: “P” is price adjustment amount “R₁” is the present price of the construction material (Source of indices shall be those listed in the Bidding forms) “R₀” is the base price of the construction material “Q” is quantity of the construction material consumed in construction during the period of price adjustment consideration If the Base price and source is to be proposed by the Bidder as per the provision made in Section –IV, Bidding Forms-Table of Price Adjustment Data then the Base price and source filled by Bidder for the construction material stated in the Bidding Form shall be subject to the approval of the Project manager and shall be as stated in SCC.. 53.7 The Price Adjustment amount shall be limited to a maximum of the initial Contract Amount as specified in the SCC. 53.8 The Price Adjustment provision shall not be applicable for delayed period if the contract is not completed in time due to the delay caused by the contractor or the contract is a Lump sum Contract.
54. Retention	54.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the SCC until Completion of the whole of the Works. 54.2 Upon the issue of a Defects Liability Certificate by the Project Manager, in accordance with GCC 70.1, half the total amount retained shall be repaid to the Contractor and half when the Contractor has submitted the evidence of submission of tax return to the concerned Internal Revenue Office. 54.3 The Contractor may substitute retention money with an unconditional bank guarantee issued from Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law if: (a) at least eighty (80) percent of the whole works have been completed, (b) progress of the works is satisfactory in accordance with the Contract as per approved work schedule, and (c) it can be assured that the works can be completed at the intended completion date. The validity of the bank guarantee under this sub-clause shall be at least 30 days beyond the end of Defect Liability Period.

	54.4 If retention money is substituted by bank guarantee in accordance with clause 54.3, the bank guarantee shall be submitted either using the Retention Money Security Form included in Section X (Contract Forms) or in another Form acceptable to the employer. The validity of the bank guarantee shall be at least one month more than the end of defect liability period.
55. Liquidated Damages	55.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the SCC for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the SCC . The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.
	55.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC 49.
56. Bonus	56.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the SCC for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.
57. Advance Payment	57.1 Unless otherwise stated in SCC , the Employer shall make advance payment to the Contractor of the amounts stated in the SCC in a separate bank account maintained for the contract in two equal installments by the date stated in the SCC , against provision by the Contractor of an unconditional bank guarantee from Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law in Nepal in a form acceptable to the Employer in amounts equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment. The validity of the bank guarantee under this sub-clause shall be at least 30 days beyond the end of intended completion date. The contractor shall submit the list of activities for which the Advance Payment for mobilization is to be used along with their time schedules.
	57.2 The Contractor is to use the advance payment only to pay for the purpose of construction site preparation, establishment of temporary camp facilities, construction of workers' housing, mobilization of labors, materials or equipment etc required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.
	57.3 The advance payment shall be repaid by deducting proportionate amounts, as stated in SCC , from payments otherwise due Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.
	57.4 If the advance provided under GCC 57.1 is not repaid due to non-performance of

	the works under the contract, by the Contractor within the time period specified in the Contract, the Employer shall recover the advance by enforcing the bank guarantee as provided under GCC 57.1, and shall also recover interest on the advance amount from the Contractor at a rate stated in SCC .
58. Securities	58.1 The Performance Security, including any additional security required as per ITB 35.5, shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount specified in the SCC , by a Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law in Nepal in accordance with the conditions of Contract using Sample Form for the Performance Security included in Section X (Contract Forms), or another form acceptable to the Employer, and denominated in Nepalese Rupees. The Performance Security shall be valid until a date 30 days beyond the end of the Defect Liability Period. However, any additional performance security required as per ITB 35.5 shall be valid until a date 30 days beyond the end of the intended completion date.
	58.2 The performance security issued by any foreign Bank outside Nepal must be counter guaranteed by Commercial Bank or Financial Institution eligible to issue Bank Guarantee as per prevailing Law in Nepal.
59. Dayworks	59.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.
	59.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within two days of the work being done.
	59.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.
60. Cost of Repairs	60.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.
F. Force Majeure	
61. Definition of Force Majeure	61.1 In this Clause, "Force Majeure" means an exceptional event or circumstance, (a) which is beyond a Party's control; (b) which such Party could not reasonably have provided against before entering into the Contract; (c) which, having arisen, such Party could not reasonably have avoided or overcome; and (d) which is not substantially attributable to the other Party.
	61.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied: (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies; (b) rebellion, terrorism, sabotage by persons other than the Contractor's

	Personnel, revolution, insurrection, military or usurped power, or civil war; (c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel; (d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity; and (e) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.
62. Notice of Force Majeure	62.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure. 62.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them. 62.3 Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.
63. Duty to Minimize Delay	63.1 Each Party shall at all times use all reasonable endeavors to minimize any delay in the performance of the Contract as a result of Force Majeure. 63.2 A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.
64. Consequences of Force Majeure	64.1 If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under GCC 62, and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to GCC 30 to (a) an extension of time for any such delay, if completion is or will be delayed, under GCC35 ; and (b) if the event or circumstance is of the kind described in sub-paragraphs (a) to (d) of GCC 61.2 and, in the case of subparagraphs (b) to (d), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destructed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in GCC 19. 64.2 After receiving this notice, the Project Manager shall proceed in accordance with GCC 10 to agree or determine these matters.
65. Force Majeure Affecting Subcontractor	65.1 If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's nonperformance or entitle him to relief under this Clause.
66. Optional Termination,	66.1 If the execution of substantially all the Works in progress is prevented for a continuous period of 90 days by reason of Force Majeure of which notice has been given under GCC 62, or for multiple periods which total more than 150 days

Payment and Release	due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with GCC 72.5. 66.2 Upon such termination, the Project Manager shall determine the value of the work done and issue a Payment Certificate, which shall include (a) the amounts payable for any work carried out for which a price is stated in the Contract; (b) the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal; (c) other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works; (d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and (e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.
67. Release from Performance	67.1 Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises, which makes it impossible or unlawful for either or both Parties to fulfill its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance, (a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract; and (b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under GCC 66 if the Contract had been terminated under GCC 66.
G. Finishing the Contract	
68. Completion	68.1 The Contractor shall request the Project Manager to issue a certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the work is completed.
	68.2 In addition to the other provisions, before acceptance of the completed works, Employer shall verify and assure that such works are within the set objective, quality and appropriate to operate and use.
69. Taking Over	69.1 In the contractor's Opinion, if the works are complete and ready for taking over, the contractor may apply by notice to the Project Manager for a Taking-Over Certificate. If the Works are divided into Sections, the Contractor may similarly apply for a Taking-Over Certificate for each Section. 69.2 The Project Manager shall, within 30 days after receiving the Contractor's application: (a) issue the Taking-Over Certificate to the Contractor if physical progress of works is at least ninety (90) percent in accordance with the Contract except

	for any minor outstanding work and defects (as listed in the Taking-Over Certificate) which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied); or (b) reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause. 69.3 If the Engineer fails either to issue the Taking-Over Certificate or to reject the Contractor's application within the period of 30 days, and if the Works or Section (as the case may be) are substantially completed in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.
70. Final Account	70.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 60 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 60 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.
71. Operating and Maintenance Manuals	71.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the SCC. 71.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the SCC pursuant to GCC 71.1, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the SCC from payments due to the Contractor.
72. Termination	72.1 The Employer may terminate the Contract at any time if the contractor; - does not commence the work as per the Contract, - abandons the work without completing, - fails to achieve progress as per the Contract. 72.2 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract. 72.3 Fundamental breaches of Contract shall include, but shall not be limited to, the following : - the Contractor uses the advance payment for matters other than the contractual obligations, - the Contractor stops work for 30 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager; - the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 30 days; - the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation. - a payment certified by the Project Manager is not paid by the Employer to the Contractor within 90 days of the date of the Project Manager's certificate; - the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a

	reasonable period of time determined by the Project Manager; g. the Project Manager gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with GCC Sub clause 22.1 and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Project Manager; h. the Contractor does not maintain a Security, which is required; i. the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the SCC; and j. If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, pursuant to GCC 73.1. 72.4 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC 72.3 above, the Project Manager shall decide whether the breach is fundamental or not. 72.5 Notwithstanding the above, the Employer may terminate the Contract for convenience. 72.6 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.
73. Fraud and Corruption	73.1 If the Employer determines that the Contractor has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, in competing for or in executing the Contract, then the Employer may, after giving 15 days' notice to the Contractor, terminate the Contractor's employment under the Contract and expel him from the Site. 73.2 Should any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Works, then that employee shall be removed in accordance with GCC Clause 15. For the purposes of this GCC 73; (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"⁵ is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation; (iii) "collusive practice"⁶ 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"⁷ 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 (aa) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a 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 (bb) acts intended to materially impede the exercise of the GON's/DP's

	inspection and audit rights provided for under GCC28.3. 73.3 The contractor shall be prosecuted for offenses under prevailing criminal laws, if the contractor: (i) Misuses the Advance Payment or payments received from the Employer; (ii) Receives payment by submitting false information or documents; (iii) Abandons the works before completion; (iv) Commits a serious violation of the contract; or (v) Causes loss or damage to the Employer.
74. Black Listing	74.1 Without prejudice to any other rights of the Employer under this Contract, GoN, Public Procurement Monitoring Office (PPMO), on the recommendation of procuring entity, may blacklist a Bidder or contractor for its conduct for a period of one (1) to three (3) years on the following grounds and seriousness of the act committed by the bidder or contractor: (a) if it is established that the Contractor has committed substantial defect in implementation of the contract or has not substantially fulfilled its obligations under the contract or the completed work is not of the specified quality as per the contract. (b) If convicted from a court of law in a criminal offense liable to be disqualified for taking part in procurement contract, (c) If it is established that the Contractor has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.
75. Payment upon Termination	75.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer. 75.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate. 75.3 If the Contract is terminated because of fundamental breach of Contract or for any other fault by the Contractor, the Employer may: (a) withhold further payments to the Contractor until the costs of design, execution, completion and remedying of any defects, liquidated damages (if any), and all other costs incurred by the Employer, have been established, and/or (b) recover from the Contractor any losses and damages incurred by the Employer and any additional costs of completing the Works, after allowing for any sum due to the Contractor, as Government dues. After recovering any such losses, damages and extra costs, the Employer shall pay any balance to the Contractor. (c) forfeit the Performance Security. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.
76. Property	76.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

77. Release from Performance	77.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.
78. Suspension of DP Loan/Credit/ Grant	78.1 In the event that the DP suspends the loan/ credit/grant to the Employer from which part of the payments to the Contractor are being made: a. the Employer is obligated to notify the Contractor of such suspension within 7 days of having received the DP's suspension notice; and b. if the Contractor has not received sums due him within the 30 days for payment provided for in GCC 49.1, the Contractor may immediately issue a 15-day termination notice.
79. Eligibility	79.1 The Contractor shall have the nationality of an eligible country as specified in Section V of the bidding document. The Contractor shall be deemed to have the nationality of a country if the Contractor is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services. 79.2 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as specified in Section V of the bidding document and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, the Contractor may be required to provide evidence of the origin of materials, equipment, and services. 79.3 For purposes of GCC 79.2, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.
80. Project Manager's Duties and Authorities	80.1 The Project Manager's duties and authorities are restricted to the extent as stated in the SCC.
81. Quarries and Spoil Dumps	81.1 Any quarry operated as part of this Contract shall be maintained and left in a stable condition without steep slopes and be either refilled or drained and be landscaped by appropriate planting. Rock or gravel taken from a river shall be removed over some distance so as to limit the depth of material removed at any one location, not disrupt the river flow or damage or undermine the river banks. The Contractor shall not deposit excavated material on land in Government or private ownership except as directed by the Project Manager in writing or by permission in writing of the authority responsible for such land in Government ownership, or of the owner or responsible representative of the owner of such land in private ownership, and only then in those places and under such conditions as the authority, owner or responsible representative may prescribe.
82. Local Taxation	82.1 The prices bid by the Contractor shall include all taxes that may be levied in accordance to the laws and regulations in being in Nepal on the date 30 days prior to the closing date for submissions of Bids on the Contractor's equipment, plant and

	materials acquired for the purpose of the Contract and on the services performed under the Contract. Nothing in the Contract shall relieve the Contractor from his responsibility to pay any tax that may be levied in Nepal on profits made by him in respect of the Contract.
83. Value Added Tax	83.1 The Contract is not exempted from value added tax. An amount specified in the schedule of taxes shall be paid by the Contractor in the concerned VAT office within time frame specified in VAT regulation.
84. Income Taxes on Staff	84.1 The Contractor's staff, personnel and labor will be liable to pay personal income taxes in Nepal in respect of their salaries and wages, as are chargeable under the laws and regulations for the time being in force, and the Contractor shall perform such duties in regard to such deductions as may be imposed on him by such laws and regulations. 84.2 The issue of the Final Account Certificate pursuant to clause GCC 70 shall be made only upon submittal by the Contractor of a certificate of income tax clearance from the Government of Nepal.
85. Duties, Taxes and Royalties	85.1 Any element of royalty, duty or tax in the price of any goods including fuel oil, and lubricating oil, cement, timber, iron and iron goods locally procured by the Contractor for the works shall be included in the Contract rates and prices and no reimbursement or payment in that respect shall be made to the Contractor. 85.2 The Contractor shall familiarize himself with GON the rules and regulations with regard to customs, duties, taxes, clearing of goods and equipment, immigration and the like, and it will be necessary for him to follow the required procedures regardless of the assistance as may be provided by the Employer wherever possible. 85.3 The Contractor shall pay and shall not be entitled to the reimbursement of cost of extracting construction materials such as sand, stone/boulder, gravel, etc. from the river beds or quarries. Such prices will be levied by the local District Development Committee (DDC) as may be in force at the time. The Contractor, sub-contractor(s) employed directly by him and for whom he is responsible, will not be exempted from payment of royalties, taxes or other kinds of surcharges on these construction materials so extracted and paid for to the DDC.
86. Member of Government, etc, not Personally Liable	86.1 No member or officer of GoN or the Employer or the Project Manager or any of their respective employees shall be in any way personally bound or liable for the act or obligations of the Employer under the Contract or answerable for any default or omission in the observance or performance of any of act, matter or thing which are herein contained.
87. Approval of Use of Explosives	87.1 No explosives of any kind shall be used by the Contractor without the prior consent of the Employer in writing and the Contractor shall provide, store and handle these and all other items of every kind whatsoever required for blasting operations, all at his own expense in a manner approved in writing by the Employer.
88 Compliance with Regulations for Explosives	88.1 The Contractor shall comply with all relevant ordinances, instructions and regulations which the Government, or other person or persons having due authority, may issue from time to time regarding the handling, transportation, storage and use of explosives.
89. Permission for Blasting	89.1 The Contractor shall at all times maintain full liaison with and inform well in advance, and obtain such permission as is required from all Government authorities, public bodies and private parties whatsoever concerned or affected, or likely to be concerned or affected by blasting operation.

90. Records of Explosives	90.1 Before the beginning of the Defects Liability Period, the Contractor shall account to the satisfaction of the Project Manager for all explosives brought on to the Site during the execution of the Contract and the Contractor shall remove all unused explosives from the Site on completion of works when ordered by the Project Manager.
91. Traffic Diversion	91.1 The Contractor shall include the necessary safety procedures regarding and pedestrian traffic diversion that is needed in execution of the works. The Contractor shall include in his costing of works, any temporary works or diversion that are needed during the construction period. All traffic diversion should be designed for the safety of both the motoring public and the men at work. It shall ensure the uninterrupted flow of traffic and minimum inconvenience to the public during the period concerned. As such, adequate warning signs, flagmen and other relevant safety precautionary measures shall be provided to warn motorists and pedestrians well ahead of the intended diversion as directed by the Project Manager. All traffic devices used shall be designed in accordance with the instruction of Project Manager.
92 Social Security Fund	92.1 The contractor shall enroll the laborers, employees, or other workforce engaged in such work in the Social Security Fund in accordance with prevailing laws.
	92.2 The contractor shall be responsible to disburse the remuneration, benefits, and other payments of the laborers, employees, or workforce into the bank account of the concerned individual.
	92.3 The contractor shall be responsible for ensuring that the required work permit has been obtained in accordance with prevailing laws in respect of foreign personnel.

Section IX: Special Conditions of Contract

The following Special Conditions of Contract shall supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

Special Conditions of Contract

A. General	
GCC 1.1 (q)	The Employer is <i>Upper Arun Hydroelectric Limited, Maharajgunj, Kathmandu</i>
GCC 1.1 (v)	The Intended Completion Date for the whole of the Works shall be <i>12 months.</i>
GCC 1.1(bb) & 10.1	The Project Manager is: Project Manager of Upper Arun Hydroelectric Project. The Project Manager and Engineer are synonyms.
GCC 1.1 (ee)	The Site is located at <i>Bhotkhola Rural Municipality, Sankhuwasabha District, Nepal</i>
GCC 1.1 (hh)	The Start Date shall be <i>7th day from the date of Contract Signing.</i>
GCC 1.1 (ll)	The Works consist of <i>Design, Supply, Installation, Testing and Commissioning of 33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District</i>
GCC 2.2	Sectional Completions are: <i>N/A</i>
GCC 2.3(i)	The following documents also form part of the Contract: <i>N/A</i>
GCC 3.1	The language of the contract is ENGLISH/NEPALI The law that applies to the Contract is the law of NEPAL
GCC 11.1	The Project Manager <i>may</i> delegate any of his duties and responsibilities.
GCC 13.1	For GoN Funded: Maximum percentage of subcontracting permitted is 25% of the total contract amount (without VAT but including PS).
GCC 14.1	Schedule of other contractors: <i>N/A</i>

GCC 19.1

The minimum insurance amounts and deductibles shall be:

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 therefore) and to the construction equipment to be provided by the Contractor or its Subcontractors.

<u>Amount</u>	<u>Deductible limits</u>	<u>Parties insured</u>	<u>From</u>	<u>To</u>
110% of Contract Amount	(*)	Contractor	Dispatch Certificate	Arrival to Site

(*) Excess 5% of claimed amount subject to minimum of NRs 20,000 for normal and NRs 80,000 for act of God/major perils and collapse.

(b) Installation All Risks Insurance

i. Covering physical loss or damage to the Facilities at the Site, occurring prior to completion of the Facilities, with 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.

<u>Amount</u>	<u>Deductible limits</u>	<u>Parties insured</u>	<u>From</u>	<u>To</u>
110% of Contract Value	(*)	Contractor	Dispatch Certificate	Final Acceptance

(*) Excess 5% of claimed amount subject to minimum of NRs 10,000 for normal period and NRs 30,000 for testing 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	Deductible Limits	Parties Injured	From	To
NRs 1 million	as in (b) above	Contractor's Employees	Commencement of Works	DefectLiability Certificate
NRs 1 million	as in (b) above	Contractor's Personnel	Commencement of Works	Defect Liability Certificate
NRs 1 million	as in (b) above	Employer's Personal	Commencement of Works	DefectLiability Certificate
NRs 1 million	as in (b) above	Third Party Personnel	Commencement of Works	DefectLiability Certificate

	<u>d) Automobile Liability Insurance</u> 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. <u>(e) Workers' Compensation</u> In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed. <u>(f) Employer's Liability</u> In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed. <u>(g) Other Insurances</u> The Contractor is also required to take out and maintain at its own cost the following insurances: Details: None The Employer shall be named as co-insured under all insurance policies taken out by the Contractor except for the Third Party Liability, Workers' Compensation and Employer's Liability Insurances, and the Contractor's Subcontractors shall be named as co-insured's under all insurance policies taken out by the Contractor, except for the Cargo, Workers' Compensation and Employer's Liability Insurances. All insurers' rights of subrogation against such co-insured's for losses or claims arising out of the performance of the Contract shall be waived under such policies. i. The minimum cover for personal injury or death insurance shall, however, be not less than as per requirements of the Labor Act of Nepal.
GCC 23.1	The following shall be designed by the Contractor: PCS Report .
GCC 26.1	The Site Possession Date(s) shall be: Immediately after the start date .
GCC 30.1	The place of arbitration shall be: Kathmandu, Nepal
C. Time Control	
GCC 34.1	The Contractor shall submit for approval a Program for the Works within 30 Days from the date of the Letter of Acceptance.
GCC 34.3	The period between Program updates is 30 days. The amount to be withheld for late submission of an updated Program is 5%
D. Quality Control	
GCC 42.1	The Defects Liability Period is: Two (2) Years .
E. Cost Control	

GCC 49.1	General Payments for the Materials (Goods) offered from outside Nepal shall be made in Nepalese Rupees only. Similarly, payments for locally manufactured Materials (Goods) and Installation, Testing and Commission shall also be made in Nepali Rupees. 1. Advance Payment (i) 20 % (Twenty percent) of total Contract price may be payable in two installments: a. 10 % (Ten percent) after the signing of agreement for the mobilization of contractor's team at the site. b. The remaining 10 % (Ten percent) is conditional and shall be payable to the contractor after the contractor completes full mobilization at site and fulfills contractual obligations such as submission of insurance policies, work program, approval of Pre-Construction Survey & Engineering report (PCSE), Structural Data Sheet (SDS) and BOQ (if any unavoidable changes). Contractor is required to provide evidence related to order placement of the transformer and breaker in the form of L/C or any other applicable methods. (ii) For the Advance payment, the Bidder shall produce the unconditional advance payment bank guarantee valid for 13 months (i.e., 30 days beyond the contract completion period). If the Contractor fails to complete the works within completion time of the Contract (or extended thereof) or fails to clear the advance payment received, the advance payment made to the contractor shall be recovered by forfeiting the advance payment bank guarantee. An additional 10 % amount shall be penalized as an interest for unrecovered advance money. (iii) Payments shall be adjusted from the running bills for the deductions of Advance Payment.
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	2. Progress Payment Payment for Supply and Delivery of materials and Installation, Testing and Commissioning Works against running bill shall be made according to the progress report approved by the Employer. i. Payments to the Contractor for progress payments shall be made within reasonable time after receipt of invoices. ii. Payments to be made to the Contractor other than progress payments, if any, shall be made in accordance with the relevant clauses governing each type of payment. iii. All payments to the Contractor for Works performed under the Contract shall be in accordance with Supply and Installation items unit prices pursuant to the Bill of Quantities/ Price Schedules. iv. Payments shall be made adhering to actual verification/measurements at site. For any variations in quantity, the unit rate of the bid shall prevail. Measurement at site shall be jointly carried out by the representative/engineer of the Employer and the Contractor. v. Progress Payment shall be made only after the completion of Works under any construction unit as mentioned in Bill of Quantities as per standard drawing, specification and as directed by the Project Manager/NEA. vi. For Construction, Installation running bills at least 20% physical progress of Construction, Installation portion should be achieved at site. vii. The Payment shall be made to the Contractor in the following manner: 2.1. General items: Upon submission by the Contractor of the Insurance, Performance Guarantee, and Advance Payment Guarantee in accordance with the requirements of the Contract, the payment for the aforementioned items shall be incorporated into and paid together with the payment for the First Phase of the Design (2.2 i). The cost of manpower associated with the Operation and on-site training of the Employer's Personnel shall be paid every three (3) months, commencing from the date of commencement of the DNP, in accordance with the provisions of the Contract. 2.2. Design i. Eighty-five percent (85%) of the Design portion shall be paid against
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	Approval of Design drawings, PCSE & BOQ (if any unavoidable changes). ii. Fifteen Percent (15%) of the Contract Price for design portion shall be paid after testing and commissioning of materials and issuance of the Completion Certificate.
	2.2 Supply & Delivery of Materials i. Eighty-five Percent (85%) of the Contract Price for Supply and Delivery portion shall be paid against delivery of materials at the Site along with submission of shipping documents, inspection and test certificates issued by the Employer's inspector/nominated inspection agency (wherever applicable), factory test report, packing list, insurance certificate, certificates of origin for goods supplied from outside the country and certificate issued by the Employer evidencing delivery of materials at Site store. ii. Fifteen percent (15%) of the Contract Price for Supply and Delivery portion shall be paid after testing and commissioning of materials and issuance of the Completion Certificate. 2.3 Civil Works and Construction i. Civil works and construction portion shall be paid after the Civil Construction (as applicable) works performed in accordance with construction units and unit prices of Bill of Quantities following the progress report/running bills approved by the Employer's Representative. 2.4 Electrical Installation, Testing & Commissioning i. Eighty-five Percent (85%) of the Installation, Testing and Commissioning portion shall be paid after the erection/installation/stringing (as applicable) works performed in accordance with construction units and unit prices of Bill of Quantities following the progress report approved by the Employer. ii. Fifteen Percent (15%) of the Installation, Testing and Commissioning portion shall be paid after testing and commissioning of materials and issuance of Completion Certificate.

	2.5 Tax Deduction at Source (TDS) From each progress bill, an amount, as determined by the prevalent rules and regulations of Government of Nepal, shall be deducted and deposited with the relevant Tax Department in the Country as a deposit towards Contractor's income tax.
GCC 51	<i>Delete sub-clause 51.1 and replace with the following:</i> 1. In the country of Origin The prices bid by the Contractor shall include all taxes, duties and other charges imposed outside the Employer's country on the production, manufacture, sales and transport of the Contractor's Equipment, Plant, Materials and supplied to be used on or furnished under the Contract, and on the services performed under the Contract. 2. In Nepal General: (a) Unless otherwise specifically declared in the contract documents, the prices bid by the Contractor and its suppliers and subcontractors shall include business taxes and other taxes that may be levied in accordance with the laws and regulations in force or in effect in Nepal as of 28 days prior to the closing date for submission of tenders in the Employer's country on the Equipment, Plant, Materials and Supplies (permanent, temporary and consumables) acquired for the purpose of Contract and on the services performed under the Contract. Whatsoever provisions made in the Contract document shall not relieve the Contractor, its suppliers and subcontractors from their responsibility to pay income tax that may be levied in the Employer's country on profits made by the Contractor, its suppliers and subcontractors in respect of the Contract. (a) Value Added Tax (VAT): value added tax (VAT) shall be imposed on all imported equipment and materials to be supplied and delivered exclusively for use in the Project. The prices bid by the Contractor and its suppliers and subcontractors shall include the VAT as specified on Price Schedule. In the event that the origin of any of the contractor's or its subcontractor's or the nominated subcontractor's plant, equipment and materials is India or third country, the provisions for the exemption of customs duties and VAT as per regulation of GoN, as mentioned in this clause shall be applied. For such provision, the Contractor must submit the request for the Custom, VAT exemption along with all supporting documents as required by GoN.
	Staff Income Tax: The Contractor's staff, personnel and laborers, and those of its subcontractors, will be liable to pay personal income tax in the Employer's country, irrespective of whether they are local or foreign nationals on income earned including salaries and wages as applicable under the laws and regulation of Nepal. The Contractor shall perform such duties in regard to Tax Deduction at Source (TDS) thereof as may be applicable by such laws and regulations. Duties on Equipment, Plant, Materials and Supplies: a) Notwithstanding the provisions of this document, the Contractor's Plant and Equipment, including essential tools thereof, imported for the sole purpose of

	executing the Contract on condition of re-export upon completion of the Works, shall be exempt from payment of customs duties, VAT and applicable taxes. However, the Contractor shall deposit the amount or provide a Bank Guarantee to the GoN Customs office equal to amount of customs duties and other taxes as per the prevailing laws, rules and regulations of Nepal for those imported equipment, plant, materials and supplies at the time of import. Such deposited amounts shall be refunded, or the Bank guarantee cancelled by the Customs Office after Re-export of those imported equipment, plant, materials and supplies. b) Any plant, materials or supplies imported by the Contractor for the performance of the Works but not incorporated in the Works shall be taken out of Nepal within 90 (Ninety) days from the date of issuance of the Performance Certificate. If the Contractor disposes off or consumes any equipment, spare parts, materials or supplies within Nepal, it shall pay all customs duties, VAT, income tax on the sales proceeds and taxes applicable on such items under the laws and regulation of Nepal in force. c) Equipment, plant, materials and supplies, imported by the Contractor for execution of the Works, shall be subject to payment of customs duty as per the prevailing rules and regulations of Nepal Government. However, the custom duty shall be paid by the Contractor at the time of import and will be reimbursed by the Employer to the Contractor upon submission of the original receipt issued by the Customs Department. d) VAT shall be levied on all imported materials & equipment purchased from abroad for the use in the Works as per the prevailing rules and regulations of Government of Nepal. If, VAT is applicable at custom point, it shall be paid by the Contractor and will be reimbursed by the Employer upon the submission of original receipt issued by the concerned authority. e) VAT applicable on plant & equipment supplied directly from manufacturing plant in the Employer's country shall be reimbursed. f) The Contractor shall maintain records satisfactory to the Employer documenting use of all Plant, Materials and Supplies imported into and/or procured for the performance of the Works. If any of such Plant, Materials and/or Supplies, imported into Nepal or otherwise supplied to the Project at a special or preferential rate of Customs Duties or taxes, if applicable, are misused or found to be used or appropriated for any purpose other than the Project, the Contractor shall be held fully responsible, and liable to pay customs duties, VAT and other taxes and/or any penalties as may be imposed in accordance with the prevailing laws and regulations of Nepal.
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	g) Income tax assessed in accordance with the prevailing Income Tax Act of Nepal and as per the provision of any specific Double Taxation Agreement, shall be imposed on the Contractor, its sub-contractors and nominated sub- contractors. An advance income tax as per the prevailing income Tax Act and Finance Act shall be deducted from the monthly progress payment of the Contractor. h) Except from Custom Duties at the custom entry point, the Contractor shall pay all duties, taxes, fees and contributions levied within Nepal in Nepalese Rupees as directed by the relevant governmental department or office, or any other local statutory agency or body in accordance with the relevant rules and regulations. i) The provisions of this clause shall apply equally to foreign subcontractors or nominated subcontractors of the Contractor employed for the Works. j) The Contractor and any foreign subcontractors or nominated subcontractors employed on the Works, if not already registered in Nepal, shall be required to get registered with the Inland Revenue Department (IRD) for the purpose of the Contract, which shall be undertaken within 28 days after signing of the Contract Agreement. The Contractor, sub-contractor or the nominated subcontractor shall submit certified copies of the Registration Certificate(s) to the Project Manager within 14 days of registration. Other local fees and charges (toll taxes) shall be applied in accordance with the prevailing laws and regulations of Nepal.
GCC 53.1	The Contract is not subject to price adjustment, and the following information regarding coefficients does not apply. The coefficients and indices for adjustment of prices in Nepalese Rupees shall be as specified in the Table of Adjustment Data submitted by bidder together with the Letter of Price Bid which is approved by the Project manager. : <i>N/A</i>
GCC 53.6	Base Price of Construction Materials applicable for price adjustment shall be as per the Table of Adjustment Data submitted by Bidder together with the Letter of Price Bid which is approved by the Project manager: <i>N/A</i>
GCC 53.7	The Price Adjustment amount shall be limited to a maximum of: <i>N/A</i>
GCC 54.1	The proportion of payments retained is: 5%
GCC 55.1	The liquidated damages for the whole of the Works are 0.05 Percent of the final Contract Price (without VAT but including PS) per day. The maximum amount of liquidated damages for the whole of the Works is 10 Percent of the final Contract Price (without VAT but including PS).
GCC 56.1	The provision of bonus “Not Applicable” in the contract.
GCC 57.1	The Advance Payments shall be: 20% and shall be paid in two equal installments to the Contractor. 10 % after the signing of agreement for the mobilization of contractor's team at the site and remaining 10% after contractor completes full mobilization at site and fulfills contractual obligations such as submission of insurance policies, work programme, approval of Pre Construction Survey & Engineering report (PCSE), Structural Data Sheet (SDS) and BOQ (if any unavoidable changes). Contractor is also required to provide evidence related to order placement of the transformer and breaker in the form of L/C or any other applicable methods, both against the advance payment guarantee.

GCC 57.3	Deductions from Payment Certificates will commence in the first certificate in which the value of works executed exceeds 30% of the Contract Price. Deduction will be at the rate of 40% of the respective Interim Payment Certificate until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the end of 80 % of the approved contract price.
GCC 57.4	Recover interest on the advance amount from the Contractor should be at a rate of 10 % .
GCC 58.1	The Performance Security amount is: <i>[Insert required Amount prior to the Contract agreement].</i> <i>[insert amount including an additional amount based on ITB 40.1 and/or ITB 35.5 if the Employer has increased the Performance Security amount].</i>
G. Finishing the Contract	
GCC 71.1	The date by which operating and maintenance manuals are required is; <i>Before Handover.</i>
GCC 71.2	The date by which “as built” drawings are required is: At the time of final Bill. Moreover, should any changes be required in the ‘as built’ drawings because of rectification of any defects within the Defects Liability Period, such changes shall be incorporated and ‘as built’ drawings shall be updated accordingly before issuance of Final acceptance certificate. The amount to be withheld for failing to produce ‘as built’ drawings and/or operating and maintenance manuals is: Full value of last invoice.
GCC 72.3 (i)	The maximum number of days is: 200
GCC 80	The Project Manager has to obtain the specific approval of the Employer for taking any of the following actions : a. Approving subcontracting of any part of the works under General Conditions of Contract Clause 13; b. Certifying additional costs determined under General Conditions of Contract Clause 50; c. Determining start date under General Conditions of Contract Clause 1; d. Determining the extension of the intended Completion Date under General Conditions of Contract Clause 35; e. Issuing a Variation under General Conditions of Contract Clause 1 and 46, except in an emergency situation, as reasonably determined by the Project Manager; emergency situation may be defined as the situation when protective measures must be taken for the safety of life or of the works or of adjoining property. f. Adjustment of rates under General Conditions of Contract Clause 45;

Section X: Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and when required Advance Payment Security and Retention Money Security shall only be completed by the successful Bidder after contract award.

**Letter of Intent
[on letterhead paper of the Employer]**

Date:

To:*Name and address of the Contractor*.....

Subject: Issuance of letter of intent to award the contract.....

This is to notify you that, it is our intention to award the contract*[insert date]*
.....for execution of the*[insert name of the contract and identification number, as given in the Contract Data/SCC]* to you as your bid price Nepalese Rupees
..... *[insert amount of contract price in figures and words including taxes]* as corrected and
modified in accordance with the Instructions to Bidders is hereby selected as substantially responsive **evaluated bid closest
to the Average Bid Price.**

Authorized Signature:

Name:

Title:

CC:

[Insert name and address of all other Bidders, who submitted the bid]

[Notes on Letter of Intent

*The issuance of Letter of Intent is the information of the selection of the bid of the successful bidder by the Employer and for providing information to other unsuccessful bidders who participated in the bid as regards to the outcome of the procurement process. This standard form of Letter of Intent to Award should be filled in and sent to the successful Bidder only after evaluation and selection of substantially **responsible evaluated bid closest to the Average Bid Price.***

**Letter of Acceptance
[on letterhead paper of the Employer]**

Date:

To:*Name and address of the Contractor*.....

Subject:*Notification of Award*

This is to notify that your Bid for the Invitation of Bids dated[*Insert date of bid invitation*]
.....for execution of the.....[*Insert name of the contract and identification
number, as given in the Contract BDS/SCC*] for the Contract price of Nepalese Rupees [*insert
amount of contract price in figures and words including taxes*], as corrected in accordance with the Instructions to
Bidders is hereby accepted in accordance with the Instruction to Bidders.

You are hereby instructed to contact this office to sign the formal contract agreement within 15 days with Performance
Security of **NRs.** in accordance with the Conditions of Contract, using for that purpose the Performance
security Form included in Section X (Contract Forms) of this Bidding Document.

Authorized Signature:

Name and Title of Signatory:

Contract Agreement

THIS AGREEMENT made theday of.....between..... name of the Employer(hereinafter “the Employer”), of the one part, andname of the Contractor.....(hereinafter “the Contractor”), of the other part:

WHEREAS the Employer desires that the Works known as name of the Contractshould be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects in the sum of NRs[insert amount of contract price in words and figures including taxes](hereinafter “the Contract Price”).

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.
 - (a) the Letter of Acceptance;
 - (b) the Letters of Technical and Price Bid;
 - (c) the Addenda Nos *Insert addenda numbers if any*
 - (d) the Special Conditions of Contract;
 - (e) the List of Eligible Countries that was specified in Section V of the bidding document,
 - (f) the General Conditions of Contract;
 - (g) the Specification;
 - (h) the Drawings;
 - (i) Bill of Quantities (or Schedules of Prices for lump sum contracts), and
 - (j) Table of Price Adjustment Data
 - (k) List of Approved Subcontractors [For GoN funded project]
 - (l)[Specify if there are any other document]
3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of Nepal on the day, month and year indicated above.

Signed by
for and on behalf the Contractor in the presence of

Witness, Name Signature, Address, Date

Signed by
for and on behalf of the Employer in the presence of

Witness, Name, Signature, Address, Date

List of Approved Subcontractors

In accordance with GCC Sub-Clause 13.1, The following Subcontractors are approved for carrying out the work as specified below.

Name of Subcontractors	Description of Works	Value/Percentage of subcontract

Performance Security
(On letterhead paper of the Bank)

..... **Bank's Name, and Address of Issuing Branch or Office**..... Beneficiary:
..... Name and Address of Employer
Date:

Performance Guarantee No.:

We have been informed that **[insert name of the Contractor, which in the case of a joint venture shall be the name of the joint venture]** (hereinafter called "the Contractor") has been notified by you to sign the Contract No. **[insert reference number of the Contract]**, for the execution of **[insert name of contract and brief description of Works]** (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 Contractor, we... .. **[insert name of the Bank]**, hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of Nepalese Rupees.....**[insert amount in figures*and amount in words]**..... such sum being payable in Nepalese Rupees, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the.....**[insert day]**.Day of**[insert month, year]**, **, and any demand for payment under it 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 Revisions, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

.....
Seal of Bank and Signature(s)

Note:

All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

** The Guarantor shall insert an amount representing the percentage of the Contract Price specified in the Contract in Nepalese Rupees.*

*** Insert the date thirty days after the date specified for 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.*

**Advance Payment Security
(On letterhead paper of the Bank)**

..... **Bank's Name, and Address of Issuing Branch or Office**.....

Beneficiary.....**Name and address of employer**

Date :

Advance Payment Guarantee No.....

We have been informed that **[insert name of the Contractor, which in the case of a joint venture shall be the name of the joint venture]** (hereinafter called "the Contractor") has entered into Contract No.**[insert reference number of the contract]** dated**[date]**..... with you, for the execution of**[insert name of contract and brief description of Works]** (hereinafter called "the Contract").

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum Nepalese Rupees **[Insert amount in figures*and in words]** is to be made against an advance payment guarantee.

At the request of the Contractor, we..... **[insert name of the Bank]**, hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of Nepalese Rupees**[insert amount in figures* and amount in words]** upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor:

- (a) Used the advance payment for purposes other than the costs of mobilization in respect of the Works; or
- (b) Has failed to repay the advance payment when it has become due and payable in accordance with the conditions of the contract, specifying the amount payable by the contractor.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor 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 a copy of the interim payment certificate indicating that eighty (80) percent of the Contract Price has been certified for payment, or on the**[date]**..... day of ...**[month]**,**[year]**...**, 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 Revisions, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

.....

Seal of Bank and Signature(s)

Note:

All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

**The Guarantor shall insert an amount representing the amount of the advance payment in Nepalese Rupees of the advance payment as specified in the Contract.*

*** Insert the date Thirty days after the intended completion date. 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.*

Retention Money Security

(On letterhead paper of the Bank)

..... **Bank's Name, and Address of Issuing Branch or Office**.....

Beneficiary: _____ *[Insert name and Address of Employer]*

Date: _____ *[Insert date of issue]*

RETENTION MONEY GUARANTEE No.: *[Insert guarantee reference number]*

We have been informed that _____ *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Contractor") has entered into Contract No. _____ *[insert reference number of the contract]* dated _____ with the Beneficiary, for the execution of _____ *[insert name of contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, the Beneficiary retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when at least eighty (80) percent of the whole works have been completed, progress of the works is satisfactory in accordance with the Contract as per approved work schedule and it can be assured that the works can be completed at the intended completion date, payment of *[insert the amount of the Retention Money]* is to be made against a Retention Money guarantee.

At the request of the Contractor, we, .. *[insert name of the Bank]*, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of Nepalese Rupees _____ *[insert amount in figures and amount in words]* 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 Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or show grounds for your demand or the sum specified therein.

This guarantee shall expire no later than the day of, ...², and any demand for payment under it 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 Revisions, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

[Seal of Bank and signature(s)]

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

¹ The Guarantor shall insert the amount of the Retention Money.

² Insert the same expiry date which is 30 days more than the end of Defect Liability Period. The Employer should note that in the event of an extension of this date 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.

Annex-1

Table of Price Adjustment Data [SCC 53.1] {NOT APPLICABLE}

Code	Index Description	Source of Index*	Base Value and Date	Employer's Proposed Weighting Range (coefficient)	Bidder's Proposed Weighting (coefficient)**
1	2	3	4	5	6
	Non - adjustable (A)			0.15	0.15
	Labor (b)				
	Materials (c)				
	Equipment usage (d)				
		Total			1.00

Note: Base value and Bidder's proposed weighting coefficient to be filled as per "Bid Form of Table of Price Adjustment Data" in Bidding Forms (Section-IV) after verification by the Employer in case of the alternative provision of Bidder proposed value and weighting coefficient.

Table of Price Adjustment Data [SCC 53.6] {NOT APPLICABLE}

Code	Construction Material*	Unit	Base Price (NRs/Unit) ** (Ex-factory)	Source (Factory)**
1	2	3	4	5

** For the purpose of calculation of price adjustment, the Ex-factory price of the same source mentioned in the table shall be taken into consideration.

Note: Base Price and source to be filled as per "Bid Form of Table of Price Adjustment Data" in Bidding Forms (Section-IV) after verification by the Employer in case of the alternative provision of Bidder proposed source and base price

**Tender No.: UAHEL/083/84/SS-01: Design, Supply, Installation, Testing and Commissioning of
33/11 kV, 6/8 MVA Gola Bazar Substation at Sankhuwasabha District**

