CHANAKYA NATIONAL LAW UNIVERSITY

REQUEST FOR PROPOSAL

October 2022

NIT NO.:- CNLU/E/2022-23/17 Dated 22.10.2022

"Supply, Installation, Testing and commissioning of 33/.433 kV, 2x1600kVA Transformer Substation and other Associated Electrical Works

Prepared by

Electrical Consulting Engineers

Recommended by

Approved by

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SECTION-1
NOTICE INVITING TENDER

CHANAKYA NATIONAL LAW UNIVERSITY

NOTICE INVITING TENDER (NIT)

Chanakya National Law University invites the bids through online E-tendering System from the reputed Indian bidders for **Supply, Installation, Testing and commissioning of 33/.433 kV, 2x1600kVA Oil type Indoor transformer Substation and other Electrical Works**.

CNLU hereby publish the TENDER on e-tendering Portal (Website) i.e., https://www.tenderwizard.com/CNLU in Electronic mode hereinafter referred as "e-Tendering" and TENDER will be here under called as "e-Tender". The e-tender published online through above portal (website) consisting of standard tender conditions, specifications, schedule of quantities, drawings (if any) for above referred work. Please note that copy of the above e-tender can be downloaded from this portal and should be mandatorily submitted in Online Electronic Mode hereinafter referred as "Online Offer".

Instructions for E-Tendering

1. Tender Bidding Methodology:

a) Technical Bid & Financial Bid

2. Broad outline of activities from Bidders prospective

a) Bidder should procure Digital Signing Certificate (DSC)-III.

b) Bidder should register on our e-Procurement portal i.e., https://www.tenderwizard.in/CNLU

c) Bidder needs to register on the E-tendering portal to participate in this tender. Registration of individual firm / company should be done by one of its senior personnel vis-a-vis Authorized Signatory, who will be the main personnel, coordinating for the e-tendering activities. In the above portal terminology, this person will be referred to as the Super User (SU) of that firm/ company. For further details, please visit the https://www.tenderwizard.in/CNLU and follow further instructions as mentioned on the site.

d) After registration bidder should create Users and assign roles of the authority of his / her firm on the e-Tendering portal.

e) Bidder can view Notice Inviting Tender (NIT) or Notice Inviting quotation on the e-Tendering portal.

f) Bidder can also download the Official Copy of Tender Documents from the e-Tendering portal.

g) Bidder should submit its bid through e-Tendering portal.

h) Bidder may attend the Public/Limited Online Tender Opening Event (TOE) on the e-Tendering portal.

3. Digital Certificates

a) For integrity of data and authenticity/ non-repudiation of electronic records, and to be complaint with IT Act 2000, it is necessary for each user to have a Digital Certificate (DC). also referred to as Digital Signature Certificate (DSC) of Class III or above, issued by a Certifying Authority (CA) licensed by Controller of Certifying Authorities (CCA) [refer http://www.cca.gov.in].

Support:

1. Prospective bidders should contact our service provider M/s Karnataka State Electronics Development Corporation Ltd.

{KEIONICS (KSEDC)}, 1st floor, Old Bank of India compound, M/22, Building, Road No.- 25, S K Nagar, Patna 800001, Mobile no.:- 9771414548, 9771414547, 9934589011, 7542028164, E-mail : twbihareproc@etenderwizard.com between 10:00 am and 05:00 pm of all working days for E-Tendering process related queries.

Scope of work

 The scope of work will be as per the work description mentioned in Section 5 of this document

Eligibility Criteria

Bidder having the below mentioned qualification/documents shall be eligible for participating in this tender. List of documents are as mentioned below:

1) Duly signed & stamped scan of document in which Name of the Firm, Address with contact number, FAX, E-mail of the Firm and Firm`s Bank Account Details with Bank Name & Address and IFSC / RTGS codes mentioned.

2) Scan of PAN card (in name of Proprietor in case of Proprietorship Firm) & GST certificate

3) Scan of Affidavit as per Annexure-II

4) Scan of up to date Labour License

5) Scan of EPF Certificate

6) Scan of ESI Certificate

7) Scan of valid Character certificate of bidder issued from office of the Superintendent of Police.

8) Scan of updated valid registration certificates of appropriate Class with works department of State Government for the above works. Bidders are registered under Central Government / Public Undertakings may participate in this bid but they will have to get themselves registered with work department of state government after issue of letter of acceptance and before agreement.

9) Scan of Experience Certificate (Which should be issued by an officer of at least Executive engineer rank of works department of State of Bihar or equivalent).

10) Scan of Single work order and agreement of similar work not less than the amount equal to ₹ 3,68,36,407/- (Rupees Three Crore Sixty Eight Lakhs Thirty Six Thousand Four Hundred Seven Only); or Two work orders and agreement similar work each not less than the amount equal to ₹ 2,30,22,755/- (Rupees Two Crore Thirty Lakhs Twenty Two Thousand Seven Hundred Fifty Five Only) or Three work orders and agreement similar work each not less than the amount equal to ₹ 1,84,18,204/- (Rupees One Crore Eighty Four Lakhs Eighteen Thousand Two Hundred Four Only) during the last five financial years (from 2016-17 to 2020-21) with Scan copy of satisfactory work completion certificate issued by Central or State Government or National Level Organization .

11) Scan of Audited balance sheet and Profit & Loss Account for the financial years 2018-19, 2019-20 and 2020-21 with Minimum Average Annual Turnover (MAAT) being ₹ 2, 30, 22,755/- (Rupees Two Crore Thirty Lac Twenty Two Thousand Seven Hundred Fifty Five Only).

12) Scan of the receipt of deposit through NEFT / RTGS for EMD.

13) Scan of the receipt of deposit through NEFT / RTGS for Cost of Document.

The details of Tender based on percentage rate and item rate on e- tendering are as f o l l o w s :

NIT NO.:-	:	CNLU/E/2022-23/17 Dated 22.10.2022
Name of the Work	:	"Supply, Installation, Testing and commissioning of 33/.433 kV, 2x1600kVA Oil type Indoor transformer Substation and other Electrical Works"
Brief Scope of Work	:	"Supply, Installation, Testing and commissioning of 33/.433 kV, 2x1600KVA Oil type Indoor transformer Substation and other Electrical Works"
Estimated Cost	:	₹ 4,60,45,509/- (Rupees Four Crore Sixty Lakhs Forty Five Thousand Five Hundred Nine Only)
Period of Completion	:	Six (06) Months
Earnest Money Deposit	:	₹ 9,20,910/- (Rupees Nine Lakhs Twenty Thousand Nine Hundred Ten Only)
Non-refundable cost of e- Tender Document	:	₹10000/- (Ten Thousand Rupees Only)
Tender document available for download from	:	22.10.2022 , 17:00 Hrs
Last date & time of online submission of Tender documents	:	22.11.2022 , 15:00 hrs
Date & Time of Opening of technical Bid	:	23.11.2022 , 1:00 hrs
Date & Time of Opening of Financial Bid	:	Will be intimated to the successful bidders.
Validity of offer		180 days from the date of opening of price bid.
Pre-Bid Meeting & Venue		09.11.2022 at 12:00 hrs, Registrar`s Chamber

- **Availability of Tender**
  Tender documents can be available for download in the tender section at front page of CNLU website i.e., https://cnlu.ac.in and in the CNLU`s e-Tender portal i.e., https://www.tenderwizard.in/CNLU
- **Terms & Conditions**
  I. Tender document shall not be acceptable through post, courier or any offline mode. Interested bidders are advised to submit the bid only though our e-Tendering portal.

  II. Scanned documents as mentioned in Eligibility criteria is mandatory. Bidder should upload all the scan of Genuine documents otherwise their technical bid shall be declared non responsive.

  IV. Bidder or their authorized representative shall remain present during the Pre-Bid meeting and at the time of opening of Technical Bid and bidders whose technical quotation is declared responsive shall remain present at the time of opening of Financial Bid**.**

  V. The price will be remain firm and fixed during the pendency of contract. It will not vary on any account including revision of taxes, imposition of new tax or any contingency whatsoever.

  VI. EMD Cost: ₹ 9,20,910/- (Rupees Nine Lakhs Twenty Thousand Nine Hundred Ten Only) should be submitted through **NEFT / RTGS to our Account Number 1287558119 of Central Bank of India, Branch: Fraser Road, Patna Main, IFSC Code: CBIN0281668.** Scan of the receipt of depository should be uploaded on our e-tendering portal while submitting the bid.

  VII. Cost of tender fee: ₹ 10,000.00 (Rupees Ten Thousand Only) and should be submitted through **NEFT / RTGS to our Account Number 1287558119 of Central Bank of India, Branch: Fraser Road, Patna Main, IFSC Code: CBIN0281668.** Scan of the receipt of depository should be uploaded on our e-tendering portal while submitting the bid.

  VIII. Tender processing fee: ₹ 5,782.00 (Rupees Three Thousand Four Hundred Twenty Two Only) should be submitted through payment gateway to service provider.

  IX. Incomplete bid and bid without genuine documents are liable for rejection. No responsibility will be taken for any type of technical glitch while online submission of bid

  X. Notwithstanding anything to the contrary in this document, Chanakya National Law University is not bound to accept the lowest bid and reserves the right to accept or reject any bid, to reject bids for some or all items and to cancel the bidding process at any time prior to the award of contract, without assigning any reason whatsoever.

  XI. University will not provide any residential facility to workers / authorities of successful bidder inside campus. Firm will make temporary shade inside campus. Water and electrical facility for such shade will be chargeable.

  XII. The work is required to be completed within the period mentioned against the works i.e. **within six months**. It will be reckoned from the date of the issue of work order after agreement. If the work is not completed within the stipulated completion period liquidated damages @0.5% of agreement value per day of delay will be levied (subject to maximum of 10%). If the liquidated damages reach the level of 10% the agreement value the contract is liable to be rescinded

XIII. Work shall be done strictly as per specification and direction of competent authority of CNLU, Patna.

XIV. Any Suggestions/Clarifications may be put forth in the pre bid meeting or through written letter / e- mail to registrar@cnlu.ac.in up to 15/11/2022 till 01:00 pm.

XV. Dispute, if any, will subject to Patna Jurisdiction only. The decision of Vice-Chancellor, CNLU will be final and binding with both the parties viz: bidder and the University

XVI. Price should be quoted in Indian Rupees only. The price will remain firm and fixed during the pendency of Contract and will Not be changed for any reason (including revision of taxes & levies whatsover)

XVII. All labour laws & regulations are to be followed by the bidder.

XVIII. The bidder shall be bound to follow the restriction on the movement of labour, materials imposed by any other authority connected with the site due to security or any other reasons connected with the event. No claim shall be entertained on this account.

XIX. The bidder shall take all precautions to avoid accidents by exhibiting necessary cautions boards, lights, flags etc. and ensure that no hindrance is caused to the traffic. Bidder shall be responsible for all damages, accidents, caused due to negligence.

XX. The contractor shall arrange all tools and plants necessary for the execution of the work at his own cost. Any loss or damage in this case will be to his account.

XXI. Lowest responsive bidder will be considered on the total amount of bids of the respective work.

XXII. The contractor under these contracts commits himself to use first class material and assumes full responsibility for the quality of all materials incorporated or brought for incorporation in the work. The work shall be executed in accordance with best engineering practice and as per direction of competent authority of CNLU.

XXIII. All the excavated materials including debris, loose earth etc., shall be carted away and disposed of as directed by competent authority of CNLU.

XXIV. Technical officers/Staff deployed by the Contractor / Firm at any construction site will also be responsible for inferior quality/Poor performance of any work and their names will be circulated to all works departments to debar them from any other site.

XXV. All the risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the contract other than the expected risks will be the responsibility of the contractor/ firm.

XXVI. Any deviation in the material and the specifications from the accepted terms may liable to be rejected. The bidders need to supply all the goods in the specified form to the satisfaction / specifications specified in the order / contract and demonstrate at their own cost.

XXVII. Chanakya National Law University reserves the right to withdraw / cancel / amend the quotation at any stage without assigning any reason whatsoever.

XXIX. Bidders should quote up to 15% maximum below of estimated cost (e.g. If the estimated cost is 100 lakhs the minimum amount which can be quoted without rate analysis will be 85 lakhs), if bidders are quoting more than 15% maximum below the estimated cost they are required to submit the justification along with rate analysis for the tendered rate enclosing the supporting documents related to the rates of inputs to establish the basis of such analysis. Offer shall be summarily rejected if proper justification not enclosed.

XXX. **Amendment of Bid Document:**

a) At any time prior to the last date for receipt of bids, the Chanakya National Law University, Patna may for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bid Document by an amendment.

b) The amendment will be notified through official website of Chanakya National Law University for all the prospective Bidders.

c) In order to afford prospective bidder reasonable time in which to take the amendment into account in preparing and submitting their bids on line, the University may, at its discretion, extend the last date for the receipt of the bid.

XXXI. **Payment Terms**

Payment will be released after the satisfactory report of competent authority / authorities for successful completion of work after necessary deduction as mentioned hereunder:

i. **Applicable TDS** will be deducted from the bill of total amount without tax as per the provision of Government of India and certificate for the same will be issue,

ii. **Applicable amount** will be deducted from total GST

XXXII. **Agreement & Performance Security**

a) Successful bidder will be issued a letter of acceptance. After receipt successful bidder shall enter into the agreement on PWD Form F2 failing which on **₹ 1,000.00 (Rupees One Thousand) non judicial stamp paper** within (20) **twenty working days** from the **date of issue of work order**.

b) EMD shall be adjusted in amount of performance security. Successful bidder will deposit amount of performance security @ 3% of agreement value, after deducting amount of EMD, in form of **NEFT / RTGS/ DD** at the time of agreement. Thus initial Performance security will be @ **5% (Five Percent)** of the agreement value along with additional performance as applicable. Balance 5% of performance security will be deducted from on account running bills. Performance Security will be refundable after **60 days of successful completion of defect liability period i.e., One Year**. No interest will be payable on the earnest money as well as Performance Securities.

Annexure-I

MEMORANDUM

Sl. No.	Description	Values/Description to be Applicable for Relevant Clause (S)
1)	Name of Work	"Supply, Installation, Testing and commissioning of 33/.433 kV, 2x1600KVA Oil type Indoor transformer Substation and other Electrical Works"
2)	Client/Owner	Chanakya National Law University
3)	Type of Tender	Percentage rate for Schedule item/ Item Rate for Non Schedule item.
4)	Earnest Money Deposit	₹ 9,20,910/- (Rupees Nine Lakhs Twenty Thousand Nine Hundred Ten Only)
5)	Estimated Cost	₹ 4,60,45,509/- (Rupees Four Crore Sixty Lakhs Forty Five Thousand Five Hundred Nine Only)
6)	Time allowed for Completion of Work	Six (06) Months
7)	Schedule of rates applicable	DSR E_M 2018, BSR 2018, Non SOR
8)	Validity of Tender	180 (One Hundred Eighty) Days
9)	Performance Guarantee	10.00 % (Ten Percent Only) of contract value as explained in agreement & performance security
10)	Minimum Average Annual Turnover Requirement	₹ 2,30,22,755/- (Rupees Two Crore Thirty Lac Twenty Two Thousand Seven Hundred Fifty Five Only) for last three financial years ie 2018-19, 2019-20, 2020-21.
11)	Technical Experience Requirement	Single Work order and agreement similar work of ₹ 3,68,36,407/- (Rupees Three Crore Sixty Eight Lakhs Thirty Six Thousand Four Hundred Seven Only) Two work orders and agreement similar work each not less than the amount equal to ₹2,30,22,755/- (Rupees Two Crore Thirty Lakhs Twenty Two Thousand Seven Hundred Fifty Five Only) or Three work orders and agreement similar work (including painting) each not less than the amount equal to ₹1,84,18,204/- (Rupees One Crore Eighty Four Lakhs Eighteen Thousand Two Hundred Four Only) in the last Five Financial Year ie from 2017-18 to 2021-22
11)	Time allowed for starting the work	The date of start of contract shall be reckoned from 10 days after the date of issue of letter of Award.
12)	Defect Liability Period	12 months (One Year) from the date of taking over of the work by the CNLU or time allowed whichever is earlier.

TECHNICAL BID

[PRE-QUALIFICATION CRITERIA FOR BIDDERS]

1. Proof of EMD and Tender Fee submission in the form of scanned copy of depository slip of NEFT/RTGS Transaction of required amount as mentioned above.
2. The Bidder should have valid registration in Government departments and having valid electrical contractor License from concerned department for execution of electrification work. (In case Bidder not holding valid electrical contractor License from concerned department they must submit an affidavit confirming that if work is awarded, they will get registered before starting the same).

3. The Average annual financial turnover for last 3 years (2018-19, 2019-20 and 2020-21) shall be at least ₹ 2,30,22,755/- (Rupees Two Crore Thirty Lac Twenty Two Thousand Seven Hundred Fifty Five Only). Copies of balance sheets of last three financial years OR duly certified by a Chartered Accountant shall be submitted in support of the requisite financial Turnover.

4. The bidder shall have successfully completed similar nature of works ie. Indoor Substation, HT/LT panel work, cable work in Government sector during the last Five (5) Five Financial Year ie from **2017-18 to 2020-22** as mentioned below: -

   Single Work order and agreement similar work of ₹ 3,68,36,407/- (Rupees Three Crore Sixty Eight Lakhs Thirty Six Thousand Four Hundred Seven Only) Two work orders and agreement similar work each not less than the amount equal to ₹ 2,30,22,755/- (Rupees Two Crore Thirty Lakhs Twenty Two Thousand Seven Hundred Fifty Five Only) or Three work orders and agreement similar work (including painting) each not less than the amount equal to ₹ 1,84,18,204/- (Rupees One Crore Eighty Four Lakhs Eighteen Thousand Two Hundred Four Only).
5. Bidder should have GST Registration, EPF Registration Certificate, Electrical contractor license & PAN Card, TAN No, ESIC certificate. (a. Information regarding the constitution of the Applicant/firm e.g., Proprietary, Partnership, Private Ltd. etc. along with proof of the same such as copies of registration/ partnership deed etc.).

6. Bidder should be a single entity. **Consortium and Joint Venture (JVs) are not allowed**.

7. **The scanned copy of above documents shall be uploaded on the portal**.

FINANCIAL PROPOSAL

1. Bidders who will be found Eligible in **Technical Proposals**, only those Bidder's financial proposals will be opened.
2. The tender will be awarded to the Bidder with the lowest quoted rate (L1) against the Probable Amount of Contract (PAC).
3. Bidders who will not be found eligible in **Technical Proposals,** they will be rejected, and their Financial Proposals will not be opened.

INSTRUCTIONS FOR FINANCIAL BID SUBMISSION-

- Quote should be in percentage higher or below on the SOR Rates the same is to quote in the form of decimal only. For example, if contractor wants to quote 5 percent higher than he must quote 1.05 and if he wants to quote 5 percent below, he must quote 0.95 in given column of financial bid sheet.
- For Non SOR items bidder can quote for individual item rates in respective financial bid sheet.
- Bidders are requested to check final figure in all the totals of all sheets. CNLU is not responsible for errors in the financial bid document.
- Any space left blank in the bidding sheet, then it will be considered as zero "0".

SECTION-2

INSTRUCTIONS TO BIDDER

INSTRUCTION TO BIDDER

A. GENERAL INSTRUCTIONS:

1 General terms of Bidding-

1.1 No Bidder shall submit more than one BID for the Project**.**

1.2 The contractor is responsible for Supply, Installation, Testing and Commissioning of all electrical work**.**

1.3 The contractor is to give the guarantee for one year against all installation and equipment defects.

1.4 The Rate should be quoted including All taxes and Charges & Nothing will be paid extra except Quoted rates. (If any rise in tax or if new tax is imposed by central or State Govt, or any Govt authority after Tender the contractor is to bear the same).

1.5 All the Civil work Should be repaired with original material including coloring if any breakage or dismantling work is done during installation of the system, including cleaning of the site, for which no extra payment shall be made to the contractor.

1.6 The rates to be given for furnished complete work, all material, labor wastage, royalties, taxes, lease rent, scaffolding, transportation charges, breakage, making good any damage to wall, ceiling, fitting etc., to make the original finish including painting, transportation, replacement, of any defective material, theft, insurance, variation in market rates, removal of rubbish dismantled material, cleaning of site be included in the quoted rates.

1.7 The contractor is to arrange for storage of material & its Security arrangement during the installation & commissioning of work.

1.8 The contractor will be fully responsible for any accident, damages, losses, that occurs during the installation & commissioning of work. No compensation will be made by the CNLU.

1.9 The contractor is to take all measures for safety and security for man & material and to follow all labor laws.

1.10 The Rates should be quoted FOR at site PATNA.

1.11 The contractor should be registered in EPF & ESIC & necessary certificate of registration shall be submitted during tendering.

1.12 The Feasibility Report/Preliminary Project Report of the Project has been assessed however the Bidders are expected to carry out their own surveys, investigations and other Preliminary examination of the Project before submitting their Bids. Nothing contained in the attached drawings/BOQ shall be binding on the CNLU nor confer any right to the Bidders, and the CNLU shall have no liability whatsoever in relation to or arising out of any or all contents of TENDER.

1.13 Notwithstanding anything to the contrary contained in this RFP, the Preliminary terms specified in the draft Agreement shall have overriding effect; provided, however, that any conditions or obligations imposed on the Bidder hereunder shall continue to have effect in addition to its obligations under the Agreement.

1.14 The Bidder shall deposit non-refundable Tender Fee of ₹ 10,000/- (Rupees Ten Thousand only) and refundable BID Security (EMD) ₹ 9, 20,910/- (Rupees Nine Lakhs Twenty Thousand Nine Hundred Ten Only) in accordance with the provisions of this RFP.

1.15 The validity period of the Bank Guarantee/EMD, shall not be less than 180 (one hundred eighty) days from the BID Due Date, inclusive of a claim period of 60 (Sixty) days, and may be extended as may be mutually agreed between the CNLU and the Bidder.

1.16 The BID shall be rejected if it is not accompanied by the Tender Fee and EMD/BID Security. The EMD/BID Security shall be refundable no later than 150 (one hundred and fifty) days from the BID Due Date except in the case of the Selected Bidder whose BID Security/EMD shall be retained till it has provided a Performance Security under the Agreement

1.17 Any condition or qualification or any other stipulation contained in the BID shall render the BID liable to rejection as a non-responsive BID.

1.18 The documents including this RFP and all attached documents, provided by the CNLU are and shall remain or become the property of the CNLU and are Transmitted to the Bidders solely for the purpose of preparation and the submission of a BID in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their BID. The provisions of this Clause shall also apply mutatis mutandis to BIDs and all other documents submitted by the Bidders, and the CNLU will not return to the Bidders any BID, document or any information provided along therewith.

1.19 This RFP is not transferable.

1.20 Any entity which has been barred by GOI or Govt of Bihar, BIHAR DISCOM for similar works, and the bar subsists as on the Bid Due Date, would not be eligible to submit the BID.

1.21 The CNLU reserves the right to reject an otherwise eligible bidder based on the information given in this tender document. The decision of the CNLU in this case shall be final.

2. **TENDER FEE AND EARNEST MONEY DEPOSIT**:

Interested contractor who wish to participate in the tender has also to make following payments through NEFT/RTGS.

Cost of Tender Document– ₹ 10,000/- should be submitted through **NEFT / RTGS to our Account Number 1287558119 of Central Bank of India, Branch: Fraser Road, Patna Main, IFSC Code: CBIN0281668.** Scan of the receipt of depository should be uploaded on our e-tendering portal while submitting the bid. Tender Fee is non-refundable.

EMD of ₹ 9,20,910/- (Rupees Nine Lakhs Twenty Thousand Nine Hundred Ten Only) should be submitted through **NEFT / RTGS to our Account Number 1287558119 of Central Bank of India, Branch: Fraser Road, Patna Main, IFSC Code: CBIN0281668.** Scan of the receipt of depository should be uploaded on our e-tendering portal while submitting the bid**.** The EMD of all unsuccessful Bidders will be returned within thirty (30) days of the Award of the contract to successful Bidder or after the receipt of their BGs verified from the Zonal office of the issuing Bank, whichever is later. No interest will be payable by the CNLU on the said amount covered under EMD/Any other Security Deposit.

The Price tender of those Bidders whose technical documents found to be in order shall be opened. The date of opening of price tender shall be informed to the Bidder.

The tender submitted shall become invalid if:

- The Bidder is found ineligible/if any document is found fake.
- The Bidder does not submit all the documents (including GST registration) as stipulated in the tender document.

If any discrepancy is noticed in the documents submitted in the office of tender opening authority.

3. VALIDITY OF TENDER:

The tender for the works shall remain open for acceptance for a period of One Hundred Eighty (180) days from the date of opening of financial tender. If any Bidder withdraws his tender before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the CNLU, then the CNLU shall, without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money as aforesaid. Further the Bidders shall not be allowed to participate in the retendering process of work.

4. ACCEPTANCE OF TENDER:

CNLU reserves the right to reject any or all the tenders in part or full without assigning any reason whatsoever. The CNLU reserves the right to award the work to a single party or split the work amongst two or more parties as deemed necessary without assigning any reason thereof. The Contractor is bound to accept the part work as offered by CNLU after splitting.

The tenders shall be strictly as per the conditions of contract. Tenders with any additional condition(s)/modifications shall be rejected.

The witnesses to the Tender/Contract Agreement shall be other than the Bidder/Bidders competing for this work and must indicate full name, address, and status/occupation with dated signatures.

The acceptance of tender will rest with the CNLU who does not bind itself to accept the lowest tender and reserves to itself the right to reject any or all the tenders received without assigning any reason thereof. Tenders in which, any of the prescribed conditions are not fulfilled or found incomplete in any respect are liable to be rejected.

On acceptance of tender, the name of the accredited representative(s) of the contractor who would be responsible for taking instructions from Engineer-in-Charge or its authorized representative shall be intimated by the contractor within 07 days of issue date of letter of Awards by CNLU.

The time of completion of the entire work, as contained in contract shall be as mentioned in “Memorandum - Annexure-I”, which shall be reckoned from the 10th day after issue of the letter of Award by the CNLU.

Canvassing whether directly or indirectly, in connection with Bidders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable for rejection.

The tender award, execution and completion of work shall be governed by tender documents consisting of (but not limited to) Letter of Award/Letter of work order, Bill of Quantities, Special Conditions of Contract, General Conditions of Contract, Specifications, Drawings. The Bidders shall be deemed to have gone through the various conditions including sub-soil water conditions, topography of the land, drainage, and accessibility etc. or any other condition which in the opinion of contractor will affect his price/rates before quoting their rates. No claim whatsoever against the foregoing shall be entertained. The drawings with the tender documents are Tender Drawing and are indicative only.

5. ADDENDA/ CORRIGENDA:

Addenda/Corrigenda to the tender documents may be issued prior to the date of submission of the tender to clarify or effect modification in specification and/or contract terms included in various tender documents. The Bidder shall suitably take into consideration such Addenda/Corrigenda while submitting his tender. The Bidder shall return such Addenda/ Corrigenda duly signed and stamped as confirmation of its receipt & acceptance and submit along with the tender document. All addenda/ Corrigenda shall

be signed and stamped on each page by the Bidder and shall become part of the tender and contract documents.

6. SITE VISIT AND COLLECTING LOCAL INFORMATION:

It will be imperative on each Bidder to fully inform himself of all local conditions and factors which may have any effect on the execution of the Contract covered under these documents and specifications. The Owner shall not entertain any request for clarifications from the Bidders, regarding such local conditions.

It must be understood and agreed that such factors have properly been investigated and considered while submitting the proposals. No claim for financial adjustment to the Contract awarded under these specifications and documents will be entertained by the Owner. Neither any change in the time schedule of the Contract nor any financial adjustments arising thereof shall be permitted by the Owner, which are based on the lack of such clear information or is effect on the cost of the Works to the Bidders.

7. ORDER OF PRECEDENCE OF DOCUMENTS:

In case of difference, contradiction, discrepancy, regarding conditions of contract, Specifications, Drawings, Bill of quantities etc. forming part of the contract, the following shall prevail in order of precedence.

Letter of Award, along with statement of agreed variations and its enclosures, if any description of Bill of Quantity/Schedule of Quantities. Special Condition of Contract. Technical specifications (General, Additional and Technical Specification) as given in Tender documents.

General Conditions of Contract. Drawings, CPWD/ CNLU specifications (as specified in Technical Specification of the Tender) update with correction slips issued up to last date of receipt of tenders. Relevant B.I.S. Codes.

SECTION-3

CLAUSES OF CONTRACT

CLAUSES OF CONTRACT(CC)

1. DEFINITIONS

The Contract means the documents forming the tender and acceptance thereof and the formal agreement executed between the competent authority on behalf of CNLU and the contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings, and instructions issued from time to time by the Engineer-in- Charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.

Chanakya National Law University, hereinafter called 'CNLU' propose to get the works executed as mentioned in the Contract on behalf of Client as Implementing agency/Executing Agency.

In the contract, the following expressions shall, unless the context otherwise requires, have the meanings, hereby respectively assigned to them: -

APPROVAL means approved in writing including subsequent written confirmation of previous verbal approval.

BILL OF QUANTITIES or SCHEDULE OF QUANTITIES means the priced and completed Bill of Quantities or Schedule of Quantities forming part of the tender.

CONTRACTOR shall mean the individual, firm**,** LLP, or company, whether incorporated or not, undertaking the works and shall include the legal personal representative of such individual or the persons composing such firm or LLP or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.

CONTRACT VALUE means the sum for which the tender is accepted as per the letter of Award.

DRAWINGS mean the drawings referred to in the contract document including modifications if any and such other drawings as may from time to time be furnished and/ or approved by CNLU.

DATE OF COMMENCEMENT OF WORK: The date of start of contract shall be reckoned from 10 days after the date of issue of letter of Award.

ENGINEER-IN-CHARGE means the Engineer of CNLU who shall supervise and be in-charge of the work.

LETTER OF AWARD shall mean CNLU's letter or notification conveying its acceptance of the tender subject to such conditions as may have been stated therein.

MONTH means English Calendar month "Day" means a Calendar day of 24 Hrs each.

CNLU shall means Chanakya National Law University, a registered under the, with its office at Near Jakanpur Police Station, Nyaya Nagar, Mithapur, Patna 800 001, Bihar, India or its Administrative officers or its engineer or other employees authorized to deal with any matter with which these persons are concerned on its behalf.

SCHEDULE(s) referred to in these conditions shall mean the standard schedule of rates of the government mentioned in the Memorandum (Annexure-I) with the amendments thereto issued up to the date of receipt of the tender.

SITE means the lands and other places on, under, in or through Which the works are to be executed or carried out and any other lands or places provided by CNLU or used for the purpose of the contract.

TENDER means the Contractor's priced offer to CNLU for the execution and completion of the work and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Award or Award letter. The word TENDER is synonymous with Tender and the Word TENDER DOCUMENTS with "Tendering Documents" or "offer documents".

WRITING means any manuscript typed written or printed statement under or over signature and/or seal.

Works or Work shall unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional. The headings in the clauses/ conditions of tender documents are for convenience only and shall not be used for interpretation of the clause/ condition.
Words imparting the singular meaning only also include the plurals and vice versa where the context requires. Words importing persons or parties shall include firms and corporations and organizations having legal capacities.

Excepted Risk are risks due to riots (other than those on account of contractor's employees), war (whether declared or not) invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, military or usurped power, any acts of Government, damages from aircraft, acts of God, such as earthquake, lightening and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the CNLU or causes solely due to use or occupation by Government of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to CNLU"s faulty design of works.

Market Rate shall be the rate as decided by the Engineer-in-Charge based on the prevailing cost of materials and labour at the site where the work is to be executed plus the percentage mentioned elsewhere in the tender document to cover, all overheads and profits.

2. **PERFORMANCE SECURITY**:

EMD shall be adjusted in amount of performance security. "Within 30 (Thirty) days from the date of issue of letter of Award or within such extended time as may be granted by CNLU in writing, the contractor shall submit to CNLU amount of performance security @ 3% of agreement value, after deducting amount of EMD, in form of **NEFT / RTGS/ DD**. Balance 5% of performance security will be deducted from on account running bills. Performance Security will be refundable after **60 days of successful completion of defect liability period i.e., One Year**. No interest will be payable on the earnest money as well as Performance Securities.
CNLU reserve the right of forfeiture of the performance guarantee in the event of the contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract.

In case the contractor fails to submit the performance guarantee of the requisite amount within the stipulated period or extended period, letter of Award automatically will stand withdrawn and EMD of the contractor shall be forfeited.

3. DEVIATIONS / VARIATIONS EXTENT AND PRICING:

The Engineer-in-Charge shall have power (i) to make any alterations in, omissions from, additions to or substitutions for, the original specifications, drawings, designs and instructions that may appear to him to be necessary during the progress of the work, (ii) to omit part of the works in case of non-availability of a portion of the site or for any other reasons and the contractor shall be bound to carry out the works in accordance with any instructions given to him in writing signed by the Engineer-in- Charge and such alterations, omissions, additions, or substitutions shall form part of the contract as if originally provided therein and any altered, additions or substituted works which the contractor may be directed to do in the manner specified above as part of the work, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereunder provided:

The time for the completion of the work shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered be extended, if requested by the contractor, as follows: in the proportion which the additional cost of the altered, additional, or substituted work bears to the original tendered value plus 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in- Charge.

If the extra items include any work for which no rate is specified in the contract, then such work shall be carried out at the rates entered in the schedule of rates for Works minus/plus the percentage quoted for scheduled items. The scheduled item means the items appearing in the Schedule of Rates (as mentioned in Memorandum (Annexure-I) Works) which shall be applicable in this clause.

However, In the case of extra item(s), (items that are completely new, and are in addition to the items contained in the contract, and not included in the schedule of rates, the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and the engineer-in-charge shall within one month of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

In the case of substituted items (items that are taken up with partial substitution or in lieu of items of work in the contract), the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para:

If the market rate for the substituted item so determined is more than the market rate of agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

If the market rate for the substituted item so determined is less than the market rate of the agreement (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

Market Rates to be determined as per clauses given in the tender document shall be based on **Prevailing rates of Material (unless mentioned otherwise)**, **Relevant**

Labour authority rate for Labour, **market rates of T&P** etc. **plus 15% towards Contractors‟ Profits and Overheads**.

The following factors may be considered in the justification of rates on which **Contractor's overhead & profit** shall not be applicable**:**
Buildings and Other Construction Worker Cess as applicable in the state of workplace, EPF (Employer Contribution) component, as per EPF act on the portion of labour's wages.

4. ESCALATION:

No claim on account of any escalation on whatsoever ground shall be entertained at any stage of works. All rates as per Bill of Quantities (BOQ) quoted by contractor shall be firm and fixed for entire contract period as well as extended period for completion of the works. No escalation shall be applicable on this contract.

5. COMPENSATION FOR DELAY:

It will be reckoned from the date of the issue of work order after agreement.

If the contractor fails to maintain the required progress to complete the work and clear the site on or before the completion schedule of contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the law to the CNLU on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below.

This will also apply to items or group of items for which a separate period of completion has been specified.

Compensation for delay of work @0.5% of agreement value per day of delay will be levied (subject to maximum of 10%). If the liquidated damages reach the level of 10% the agreement value the contract is liable to be rescinded.

The amount of compensation may be adjusted or set- off against any sum payable to the Contractor under this or any other contract with CNLU.

6. CANCELLATION/DETERMINATION OF CONTRACT IN FULL OR PART:

Subject to other provisions contained in this clause the Engineer-in-Charge may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages and / or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or un-workmanlike manner shall omit to comply with the requirement of such notice for a period of seven days thereafter: or

If the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence so that in the opinion of the Engineer-in- Charge (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Engineer-in-Charge: or

If the contractor fails to complete the work within the stipulated date and does not complete them within the period specified in a notice given in writing in that behalf by the Engineer-in-Charge; or

If the contractor persistently neglects to carry out his obligations under the contract and / or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge: or

If the contractor shall offer or give or agree to give to any person in CNLU service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any action relation to the obtaining or execution of this or any other contract for CNLU; or

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge may without prejudice to any other right or remedy which shall have accrued or shall accrue hereafter to CNLU, by a notice in writing to cancel the contract as whole or only such items of work in default from the Contract, the Engineer-in-charge shall have powers:
Take possession of site and any materials, constructional plant, implements, stores, etc. thereon; and/ or Carry out the incomplete work by any means at the risk and cost of the contractor; and/ or The Engineer-in-charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by CNLU because of action under this clause shall not exceed 10% of the tendered value of the work.

7. TERMINATION OF CONTRACT ON DEATH OF CONTRACTOR:

Without prejudice to any of the right or remedies under this contract if the contractor dies, the Engineer in-charge shall have the option of terminating the contract without compensation to the contractor.

8. TIME ESSENCE OF CONTRACT & EXTENSION FOR DELAY:

The entire works under reference is required to be completed within six (06) months from the date if issue of LOA. Time is the essence of Contract and every effort shall be made to complete the work within stipulated period of six (06) months from the date of LOA.

If the work(s) be delayed by:

1. force-majeure or
2. Abnormally bad weather, or
3. Serious loss or damage by fire, or
4. Civil commotion, local commotion of workmen, strike, or lockout, affecting any or the trades employed on the work, or
5. Delay on the part of other contractors or tradesmen engaged by Engineer-in- Charge in executing work not forming part of the Contract, or
6. Non-availability of stores, which are responsibility of the CNLU or
7. Non-availability or break down of tools and plant to be supplied or supplied by CNLU
8. Any other cause which, in the absolute discretion of the CNLU, is beyond the Contractor's control.

Request for extension of time, to be eligible for consideration, shall be made by the Contractor in writing. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired. In any such case CNLU may give a fair and reasonable extension of time for completion of work. Such extension shall be communicated to the Contractor by the Engineer-in-Charge in writing within a reasonable time from the receipt of such request. Non application by the contractor for extension of time shall not be a bar for giving a fair and reasonable extension by the Engineer-in-Charge and the extension of time so given by the Engineer-in-Charge shall be binding on the contractor.

9. TAXES AND DUTIES:

Except as otherwise specifically provided in the contract, the contractor shall be liable and responsible for the payment, of all taxes, and GST or in the state concerned which may be specified by local/state/ central government from time to time on all material articles which may be used for this work. The rates quoted by him in the tender in bill of quantities shall be inclusive of all taxes and GST. In the event of nonpayment/default in payment of any of the above taxes, CNLU reserves the right to with-hold the dues/payments of contractor and make payment to local/state/Central Government authorities or to labourers as may be applicable. The rate quoted by the contractor shall be deemed to be inclusive of all taxes as given in tender document Tax deductions at source shall be made as per laws prevalent in the State as applicable for the work.

The stamp duty and registration charges, if any, on the contract agreement levied by the Government or any other statutory body, shall be paid by the contractor as applicable in the state of work.

The Bidder shall quote his rates inclusive of Goods and Service Tax (GST) in conjunction with other terms and conditions. In the event of decrease / relaxation and / or waiver of any of the existing / prevailing tax(es), duties, levies, cess by Central / state Govt. Or any other statutory body(ies), after the last stipulated date for the receipt of tender including extension (if any), and the contractor thereupon has been paid or has raised claims of such tax(es), duties, levies, cess; such sums shall be recovered / deducted (from claims raised but which has not been paid) effective from the date as reckoned in the relevant statutory order / law / ordnance etc. The contractor, shall, within a period of 30 days of any such waiver/relaxation/decrease in tax(es), duties, levies, cess, give a written notice thereof to Engineer-in-charge stating the statutory change with Documentary proof thereto. Provided always that Engineer-in-charge shall have full powers to effect recovery/deduction on account of any such statutory change even if contractor has not intimated in the event when any such statutory action comes to his notice.

10. INCOME TAX DEDUCTION (TDS):

Income tax deductions shall be made from all payments made to the contractor including advances against work done, as per the rules and regulations in force, in accordance with the Income Tax act prevailing from time to time.

11. ROYALTY ON MATERIALS:

The contractor shall deposit royalty and obtain necessary permit for supply of bajri, stone, kankar, sand and other materials etc. from the local authorities and quoted rates shall be inclusive of royalty.

The contractor shall be deemed to have inspected the site, its surrounding and acquainted itself with the nature of the ground, accessibility of the site and full extent and nature of all operations necessary for the full and proper execution of the contract, space for storage of materials, constructional plant, temporary works, restrictions on the plying of heavy vehicles in area, supply and use of labour materials, plant, equipment and laws, rules and regulations, if any, imposed by the local authorities.

The rates and prices to be tendered in the bill of quantities are for completed and finished items of works and complete in all respects. It will be deemed to include all constructional plant, labour, supervision materials, transport, all temporary works, erection, maintenance, contractor's profit and establishment/overheads, together with preparation of designs & drawings pertaining to casting yard, shop drawing,

fabrication drawing (if required), staging form work, stacking yard, etc. all general risk, all taxes, royalty, duties, cess, octroi and other levies, insurance liabilities and obligations set out or implied in the tender documents and contract .

If any temporary/ permanent structure is encountered or safety of such structure in the vicinity is endangered due to execution of the project, the contractor must protect the structures by any means as per direction of Engineer-in–Charge. If any damage is caused to any temporary or permanent structure(s) in the vicinity due to execution of the project, the contractor must make good the same by any means as per direction of Engineer-in– Charge. The contractor should inspect the site of work from this point of view. The cost to be incurred in this regard shall be deemed to be included in his quoted rates of BOQ items and the contractor shall not be entitled for any extra payment in this regard.

12. INSURANCE OF WORKS ETC:

Contractor is required to take contractor's all risk policy or erection all risk policy (as the case may be) from an approved insurance company in the joint name with CNLU and bear all costs towards the same for the full period of execution of works including the defect liability period for the full amount of contract against all loss of damage from whatever cause arising other than excepted risks for which he is responsible under the terms of the contract and in such manner that the CNLU and the contractor are covered during the period of construction of works and/or also covered during the period of defect liability for loss or damage. The work and the temporary works to the full value of such works. The materials, constructional plant, centering, shuttering and scaffolding materials and other things brought to the site for their full value. Whenever required by CNLU, the contractor shall produce the policy or the policies of insurance and the receipts for payment of the current premium.

13. INSURANCE UNDER WORKMEN COMPENSATION ACT:

Contractor is required to take insurance cover under the Workman Compensation Act, 1923 amended from time to time from an approved insurance company and pay premium charges thereof. Wherever required by CNLU the contractor shall produce the policy or the policies of Insurance and the receipt of payment of the current premiums.

In case of failure of the contractor to obtain contractors all risk policy, and insurance under workman compensation act as described above within one month from the date of commencement of work, running account payments of the contractor shall be withheld till such time the aforesaid insurance covers are obtained by the contractor.

If the Contractor could not effect a comprehensive insurance cover against risks which he may be required to effect under the terms of the contract, then he shall give his attention to get the best insurance cover available and even in case of effecting a wider insurance cover than the one which the subsidiary of the General Insurance Company could offer, such an insurance is ought to be done after the CNLU‟s approval, by or through the subsidiary of the General Insurance Company.

The contractor shall at all times indemnify CNLU against all claims, damages or compensation under the provision of Payment of wages act-1936, Minimum Wages Act-1948, Employer‟s liability Act-1938, the workmen‟s compensation Act-1947, Industrial Disputes Act-1947 and Maternity Benefit Act- 1961 or any modifications thereof or any other law in force or as consequence of any accident or injury to any workman or other persons in or about the works, whether in the employment of the contractor or not, against all costs, charges and expenses of any suit, action or proceedings arising out of such incident or injury and against all sum or sums which may with the consent of the contractor be paid to compromise or compound any such claim. Without limiting his obligations and liabilities as above provided, the contractor shall insure against all claims, damages or compensation payable under the Workmen's Compensation Act 1923 or any modification thereof or any other law relating thereto.

14. PAYMENTS:

All running payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and/or accepted by CNLU and shall not preclude the recovery for bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the Contract, or any part thereof, in this respect, or the accruing of any claim, nor shall it conclude, determine or affect in any way the powers of the CNLU under these conditions or any of them as to the final settlement and adjustments of the accounts or otherwise, or in any other way vary/ affect the contract. The final bill shall be submitted by the contractor within three months of the completion of work, otherwise CNLU"s certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on contractor

IF THE ITEM IS SITC THEN THE BIDDER WILL GET THE PAYMENT AS FOLLOWS:

70% against supply, 20% against installation/testing and 10 % against commissioning.

All payments shall be released by way of e-transfer through RTGS/NEFT in India directly at their Bank account by CNLU.

15. MEASUREMENTS OF WORKS:

Engineer-in-charge shall, except as otherwise provided, ascertain, and determine by measurement, the value of work done in accordance with the contract. Except where any general or detailed description of the work expressly shows to the contrary, measurement shall be taken in accordance with the Procedure set forth in the CONCERNED STATE PWD/CPWD Specification. In the case of items which are not covered by specifications, mode of measurement as specified in the Technical Specifications of the contract and if for any item no such technical specification is available, then a relevant standard method of measurement issued by the Bureau of Indian Standard shall be followed.

16. WITHHOLDING AND LIEN IN RESPECT OF SUMS DUE FROM CONTRACTOR:

Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, CNLU shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any, deposited by the contractor and for the purpose aforesaid, CNLU shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, CNLU shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract pending finalization of adjudication of any such claim.

17. WORK TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, AND ORDERS ETC.:

All items of work in the bill of quantities/ schedule of quantities shall be carried out as per the concerned State Public Works Department/CPWD/ CNLU specifications, drawings, and instructions of the Engineer-in-Charge of CNLU and the rates shall include for supply of required materials including proper storage, consumables, skilled

& unskilled labour, supervision and tools, tackles, plant & machinery complete as called for in the detailed specifications and conditions of the contract. Latest updated concerned State Public Works Department/CPWD/ CNLU specification shall be followed for execution of work. The contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and otherwise in every respect in strict accordance with the specifications.

The contractor shall also conform exactly, fully, and faithfully to the design, drawings, and instructions in writing in respect of the work assigned by the Engineer-in- Charge.

The contractor shall comply with the provisions of the contract and execute the works with care and diligence and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans, and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified, or is reasonably inferred from the contract. The contractor shall take full responsibility for adequacy, suitability, and safety of all the works and methods of construction.

18. MATERIALS TO BE PROVIDED BY THE CONTRACTOR

The contractor shall, at his own expense, provide all materials, required for the works. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract.

The contractor shall, if requested by the Engineer-in-Charge furnish proof, to the satisfaction of the Engineer-in-Charge that the materials so comply.

The contractor shall at his risk and cost, submit the samples of material to be tested or analyzed and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer - in- Charge or his authorized representative shall always have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance and cost in obtaining the right and visit to such access.

The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full power to require other proper materials to be substituted thereof and in case of default, the Engineer-in- Charge may cause the same to the supplies and all costs which may require such removal and substitution shall be borne by the contractor.

19. MATERIALS:

The materials/products used on the works shall be one of the approved make/brands out of list of manufacturers/brands/makes given in the tender documents. In exceptional circumstances Engineer-in-Charge may allow alternate equivalent makes/brands of products/ materials at his sole discretion. The final choice of brand / make shall remain with the Engineer- in-Charge, whose decision in this matter shall be final and binding and nothing extra on this account shall be payable to the Contractor. In case single brand/ make are mentioned, other equivalent makes/ brands may be considered by the Engineer -in-Charge. In case of variance in concerned State Public Works Department/CPWD/CNLU/IS/BIS Specifications from approved products/makes specification, the specification of approved product/make shall prevail for which nothing shall be paid extra to the Contractor. In case no make or brand of any materials, articles, fittings, and accessories etc. is specified, the same shall comply with the relevant Indian Standard Specifications and shall bear the ISI/BIS mark. The Engineer of CNLU shall have the discretion to check quality of materials and equipments to be incorporated in the work, at source of supply or site of work and even after incorporation in the work. They shall also have the discretion to check the workmanship of various items of work to be executed in this work. The contractor shall provide the necessary facilities and assistance for this purpose.

The Contractor shall re-calibrate all measuring devices whenever so required by the Engineer-in-charge and shall submit the results of such calibration without delay. All field tests shall be carried out in the presence of CNLU‟s representative. All costs towards samples, materials, collection, transport, manpower, testing etc. shall be borne by the Contractor and are deemed to be included in the rates quoted by him in the bill of quantities.

The contractor(s) shall display the calibration certificate of each equipment at the location of equipment & shall get recalibrated at least one week before its expiry date.

20. MOBILIZATION OF MEN, MATERIALS AND MACHINERY:

All expenses towards mobilization at site and de-mobilization including bringing in equipment, work force, materials, dismantling the equipment's, clearing the site etc. shall be deemed to be included in prices quoted and no separate payment on account of such expenses shall be entertained.

It shall be entirely the Contractors responsibility to provide, operate and maintain all necessary construction equipment's, scaffoldings and safety, gadget, lifting tackles, tools, and appliances to perform the work in a workman like and efficient manner and complete all jobs as per the specifications and within the schedule time of completion of work.

It shall be the responsibility of the contractor to obtain the approval for any revision and/or modification desired by him from CNLU before implementation.

The procurement and supply in sequence and at the appropriate time of all materials and consumable shall be entirely the contractor's responsibilities and his rates for execution of work shall be inclusive of supply of all these items.

It is mandatory for the contractor to provide safety equipment's and gadgets to his all workers, supervisory and Technical staff engaged in the execution of the work while working. The minimum requirement (but not limited to) shall be gum boots, safety helmets, Rubber hand gloves, face masks, safety nets, safety belts, goggles etc. as per work requirements. Sufficient nos. of these equipment's and gadgets shall also be provided to CNLU by the contractor at his own cost for use of CNLU Officials and/ or workforce while working/supervision of work at site. No staff/ worker shall be allowed to enter the site without these equipment's/ gadgets.

The cost of the above equipment's/ gadgets is deemed to be included in the rates quoted by the contractor for the items & works as per Bill of Quantities and contractor shall not be entitled for any extra payment in these regards. The above norm is to be strictly complied with at site. In case the contractor is found to be deficient in providing Safety Equipment's/ Gadgets in the opinion of Engineer-in- charge, the Engineer-in-charge at his option can procure the same at the risk & cost of contractor and provide the same for the use of worksite and shall make the recoveries from the bills of the contractor for the same. The contractor shall abide by all rules & regulations pertaining to Health, Safety and Environment.

One copy of contract documents including drawings furnished to the contractor shall be kept at the site and the same shall at all reasonable times be available for inspection.

All materials, construction plants and equipments etc. once brought by the contractor within the project area, will not be allowed to be removed from the premises without the written permission of the Engineer-in-charge. Similarly, all enabling works built by the contractor for the main construction undertaken by him, shall not be dismantled, and removed without the written authority of the CNLU.

21. COMPLETION CERTIFICATE AND COMPLETION PLANS:

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and within thirty days of the receipt of such notice, the Engineer-in-Charge shall inspect the work and if there is no defect in the

work, shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued.

22. FORECLOSURE OF CONTRACT BY CNLU:

If at any time after the commencement of the work the CNLU shall for any reason whatsoever is required to abandon the work or is not require the whole work thereof as specified in the tender to be carried out, the Engineer-in-Charge shall give notice in writing of the fact to the contractor, who shall have no claim to any payment of compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full, but which he did not derive in consequence of the foreclosure of the whole or part of the works.

23. DEFECTS LIABILITY PERIOD:

The contractor shall be responsible for the rectification of defects in the works for a period of twelve months from the date of taking over of the works by the CNLU or clients whichever is later. Any defects discovered and brought to the notice of the contractor forthwith shall be attended to and rectified by him at his own cost and expense. In case the contractor fails to carry out these rectifications, the same may without prejudice to any other right or remedy available, be got rectified by CNLU at the cost and expense of the contractor.

24. RESTRICTION ON SUBLETTING:

The contractor shall not sublet or assign the whole or part of the works except where otherwise provided, by the contract. The provision of labour on piece work basis shall not be deemed to be a subletting under this clause.

25. FORCE MAJEURE:

Any delay in or failure to perform of either party, shall not constitute default to give rise to any claim for damages, to the extent such delay or failure to perform is caused by an act of God, or by fire, explosion, flood or other natural catastrophe, governmental legislation, orders, or regulation etc. The time for performance of the obligation by the parties shall be deemed to be extended for a period equal to the duration of the force majeure event. Both parties shall make their best efforts to minimize the delay caused by the force majeure event.

26. DIRECTION FOR WORKS:

All works under the contract shall be executed under the direction and subject to approval in all respect of the Engineer-in-Charge of CNLU who shall be entitled to direct at whatever point or points and in whatever manner works are to be commenced and executed.

The Engineer-in-Charge and his representative shall communicate or confirm their instructions to the contractor in respect of the execution of work during their site inspection in a “Works Site Order Book” maintained at the site office of Engineer-in-Charge. The contractor or his authorized representative shall confirm receipt of such instructions by signing against the relevant orders in the book.

27. SCHEDULE OF QUANTITIES / BILL OF QUANTITIES:

The quantities shown against the various items of work are only approximate quantities which may vary as per the actual requirement at site. No item which is not covered in the bill of quantities shall be executed by the Contractor without the approval of the CNLU.

In case any Extra/Substituted item is carried out without specific approval, the same will not be paid.

28. INDIAN STANDARDS:

Wherever any reference is made to any IS in any specifications, drawings, or bill of quantities, it means the Indian Standards editions with up-to-date amendments issued till last date of receipt of tender documents.

29. TESTS AND INSPECTION:

The contractor shall carry out the various mandatory tests as per specifications and the technical documents that will be furnished to him during the performance of the work. All the tests on materials, as recommended by CONCERNED STATE PWD/CPWD, CNLU and relevant Indian Standard Codes or other standard specifications (including all amendments current at the last date of submission of tender documents) shall be got carried out by the contractor at the field-testing laboratory or any other recognized institution/ laboratory, at the direction of the CNLU. All testing charges, expenses etc. shall be borne by the contractor.

30. WORKS TO BE OPEN TO INSPECTION:

All works executed or under the course of execution in pursuance of this contract shall always be open to inspection and supervision of the CNLU. The work during its progress or after its completion may also be inspected, by Chief Technical Examiner of Government of India (CTE) and/or an inspecting authority of State Government of State in which work is executed. The compliance of observations/improvements as suggested by the inspecting officers of CNLU/CTE/ State authorities shall be obligatory on the part of the Contractor at the cost of contractor.

31. CARE OF WORKS:

From the commencement to the completion of works and handing over, the contractor shall take full responsibility for care thereof all the works and in case of any damage/loss to the works or to any part thereof or to any temporary works due to lack of precautions or due to negligence on part of Contractor, the same shall be made good by the Contractor.

32. NOTICE BEFORE COVERING UP THE WORK:

The contractor shall give not less than seven days' notice before covering up or otherwise placing beyond the reach of measurement any work, to the Engineer-in-charge in order that the same may be inspected and measured. If any work is covered up or placed beyond the reach of inspection/measurement without such notice or his consent being obtained the same shall be uncovered at the contractor expenses and he shall have to make it good at his own expenses.

33. SITE CLEARANCE:

The contractor shall ensure that the working site is kept clean and free of obstructions for easy access to job site and from safety point of view. Before handing over the work to the CNLU the contractor shall remove all temporary structures like the site offices, cement go-down, stores, labour hutments etc., scaffolding rubbish, debris etc. left-over materials tools and plants, equipments etc., clean the site to the entire satisfaction of the Engineer-in-charge. If this is not done the same will be got done by CNLU at his risk and cost.

The contractor shall clean all floors, remove cement/ lime/ paint drops and deposits, clean joinery, glass panes etc., touching all painter's works and carry out all other necessary items of works to make the premises clean and tidy before handing over the building, and the rates quoted by the contractor shall be deemed to have included the same.

34. SET-OFF OF CONTRACTOR'S LIABILITIES:

CNLU shall have the right to deduct or set off the expenses incurred or likely to be incurred by it in rectifying the defects and/or any claim under this agreement against the Contractor from any or against any amount payable to the contractor under this agreement including security deposit and proceeds of performance guarantee.

35. POSSESSION PRIOR TO COMPLETION:

CNLU shall have the right to take possession of or use any completed or partially completed work or part of the work. Such possession or use shall not be deemed to be any acceptance of any work not completed in accordance with the contract agreement. If such prior possession or use by CNLU delays the progress of work an equitable adjustment in the time of completion will be made and the contract agreement shall be deemed to be modified accordingly. The decision of CNLU in such case shall be final binding and conclusive.

When the whole of the works or the items or the groups of items of work have been completed the contractor will give a notice to that effect to the Engineer in writing. The Engineer shall within 7 days of the date of receipt of such notice inspect the works and give instructions in writing to the contractor specifying the balance items of work which are required to be done by the contractor and shall also notify the contractor of any defect in the works affecting completion.

The contractor shall during execution prepare and keep updated a complete set of "as built" drawings to show each change from the contract drawings, changes recorded shall be countersigned by the Engineer- in- Charge and the contractor. Four copies of "as build" drawings shall be supplied to CNLU by the contractor within 30 days of the completion. All costs incurred in this respect shall be borne by the contractor.

36. EMPLOYMENT OF PERSONNEL:

The contractor shall employ only Indian Nationals as his representatives, servants, and workmen after verifying their antecedents and loyalty. He shall ensure that no personnel of doubtful antecedents and any other nationality in any way is associated with the works.

In case CNLU observed misconduct negligence or incompetence etc. on the part of any representative, agent, servant and workmen or employees etc. of the contractor, the CNLU shall have full power and without giving any reason to the contractor, instruct the contractor to remove such engineer / staff / worker from site and provide suitable replacements. The decision of the Engineer-in-charge shall be final and binding on the contractor. The contractor shall not be allowed any compensation on this account.

37. TECHNICAL STAFF FOR WORK:

The contractor shall employ at his cost the adequate number of technical staff during the execution of this work depending upon the requirement of work. For this purpose, the numbers to be deployed, their qualification, experience as decided by CNLU shall be final and binding on contractor. The contractor shall not be entitled for any extra payment in this regard. The technical staff should be available at site, whenever required by CNLU to take instructions.

38. VALUABLE ARTICLES FOUND AT SITE:

All gold, silver and other minerals of any description and all precious stones, coins, treasure, relics, antiques, and all other similar things which shall be found in, under or upon the site, shall be the property of the CNLU.

39. MATERIALS OBTAINED FROM DISMANTLEMENT TO BE CNLU'S PROPERTY:

All materials like stone, boulders and other materials obtained during the work of dismantling, excavation etc. will be considered CNLU property and such materials shall be disposed of to the best advantage of CNLU according to the instructions in writing issued by the Engineer-in-charge.

40. LABOUR LAWS – LABOUR LAWS TO BE COMPLIED BY THE CONTRACTOR

The contractor shall obtain a valid license under the contract labour (Regulation & Abolition) Act 1970 and the contract labour Act (Regulation & Abolition) Central Rules 1971 and amended from time to time and continue to have a valid license until the completion of the work including defect liability period. The contractor shall also adhere by the provision of the child labour (Prohibition and Regulation) Act. 1986 and as amended from time to time.

The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.

Any failure to fulfil above requirement shall attract the penal provisions of this contract arising out the resultant for non-execution of the work before the commencement of work. No labour below the age of 18 years shall be employed on the work.

Payment of wages:

The contractor shall pay to labour employed by him either directly or through subcontractors, wages not less than fair wages as defined in the CNLU Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him

In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with the CNLU contractor's Labour Regulations in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorizedly made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non- fulfilment of the conditions of the contract for the benefit of the workers, non- payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.

The contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefits Act, 1961, and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws relating thereto, and the rules made there under from time to time.

The contractor shall indemnify and keep indemnified CNLU against payments to be made under and for the observance of the laws aforesaid and the CNLU Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.

The laws aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

Observance Of Labour Laws

The contractor shall be fully responsible for observance of all labour laws applicable including local laws and other laws applicable in this matter and shall indemnify and keep indemnified CNLU against effect or non-observance of any such laws. The contractor shall be liable to make payment to all its employees, workers and sub-contractors and make compliance with labour laws. If CNLU is held liable as "Principal Employer" to pay contributions etc. under legislation of Government or Court decision in respect of the employees of the contractor, then the contractor would reimburse the amount of such payments, contribution etc. to CNLU and/ or same shall be deducted from the payments, security deposit etc. of the contract.

Minimum Wages Act

The contractor shall comply with all the provisions of the minimum wages Act,1948, contract labour Act (Regulation & Abolition) 1970, and rules framed there under and other labour laws/local laws affecting contract labour that may be brought into force from time to time.

Every contractor, sub-contractor, affiliates, their legal assigns or heirs as the case may, shall be responsible for registration of every Building worker who has completed eighteen years of age but has not completed sixty years of age and who has been engaged in any Building or Other Construction Work for not less than Ninety Days during the preceding twelve months; with the Board / Funds as applicable under various sections of "THE BUILDINGS AND OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 and THE BUILDING AND OTHER CONSTRUCTIONWORKERS" WELFARE CESS ACT, 1996.

The contractor shall also be responsible for maintaining register of beneficiaries i.e., the workers in such form as may be prescribed by the competent authority & the same shall be kept open at all reasonable times for inspection of relevant authority and officials of client / CNLU.

The contractor shall be further responsible for maintaining such register & records; giving such particulars of Building workers employed by him, the work performed by them, the number of hours of work which shall constitute a normal working day, the wages paid to them, the receipts given by them and, such other particulars in such form as may be prescribed by the authority or CNLU.

In the event of contractor failing to comply with the above clause(s) in part or in full, CNLU, without prejudice to any other rights or remedy available under law or any other clause(s) of contract, shall be at absolute liberty to forfeit any sum or sums that are

payable or could become payable on account of execution of contract work and decision of Engineer-in-charge shall be final & binding in this regard on the contractor.

Recovery of Compensation Paid To Workmen

In every case in which by virtue of the provisions of the Workmen's Compensation Act, 1923, CNLU is obliged to pay compensation to a workman employed by the contractor, in execution of the works, CNLU will recover from the contractor, the amount of the compensation so paid; and, without prejudice to the rights of the CNLU under the provision of the said Act, CNLU shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due to the contractor whether under this contract or otherwise. CNLU shall not be bound to contest any claim made against it, except on the written request of the contractor and upon his giving to CNLU full security for all costs for which CNLU might become liable in consequence of contesting such claim.

Ensuring Payment And Amenities To Workers If Contractor Fails

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation and Abolition) Central Rules, 1971, CNLU is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act or under the CNLU Contractor's Labour Regulations, or under the Rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by CNLUs Contractors, CNLU will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to any other right or remedy available under this contract, CNLU shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by CNLU to the contractor whether under this contract or otherwise CNLU shall not be bound to contest any claim made against it, except on the written request of the contractor and upon his giving to the CNLU full security for all costs for which CNLU might become liable in contesting such claim.

41. LAW COVERING THE CONTRACT:

This contract shall be governed by the Indian laws for the time being in force.

42. LAWS, BYE-LAWS RELATING TO THE WORK:

The contractor shall strictly adhere by the provisions, for the time being in force, of law relating to works or any regulations and bylaws made by any local authority or any water & lighting agencies or any undertakings within the limits of the jurisdiction of which the work is proposed to be executed. The contractor shall be bound to give to the authorities concerned such notices and take all approvals as may be provided in the law, regulations, or bylaws as aforesaid, and to pay all fees and taxes payable to such authorities in respect thereof.

43. CONTRACT AGREEMENT:

The Contractor shall enter into a Contract Agreement with the CNLU within 10 (TEN) days from the date of Letter of Award or within such extended time, as may be granted by the CNLU failing which no payment shall be released to the contractor. The cost of stamp papers, stamp duty, registration, if applicable on the contract, shall be borne by the Contractor. In case, the contractor does not sign the agreement as above or start the

work within 10 (Ten) days of the issue of letter of Award, his earnest money is liable to be forfeited and Letter of award consequently will stand withdrawn.

44. MANNER OF EXECUTION OF AGREEMENT:

The agreement as per prescribed Performa as enclosed shall be signed at the office of the CNLU within 10(TEN days) days from the date of issue of Letter of Award. The Contractor shall provide for signing of the Contract, appropriate Power of Attorney, and the requisite documents/ materials. Unless and until a formal contract is prepared and executed, the Letter of Award read in conjunction with the Tendering Documents will constitute a binding contract.

45. JURISDICTION:

The agreement shall be executed at PATNA on non-judicial stamp paper purchased in PATNA and the courts in PATNA alone will have jurisdiction to deal with matters arising there from, to the exclusion of all other courts.

46. ARBITRATION:

1. Arbitration Procedure: If the efforts, to resolve all or any of the disputes through conciliation fail, then such a dispute shall be referred within 30 days from conclusion of conciliation process to a Sole Arbitrator who would be nominated by CLNU's Patna authorized representative. The arbitration and conciliation act 1996 as amended from time to time will be applicable. The venue of such arbitration shall be at PATNA. The award of the sole Arbitrator shall be binding on all parties. The cost of Arbitration shall be borne by the respective parties. There will be no objections if the sole arbitrator nominated or appointed is an employee of CNLU.

2. The place of arbitration shall be PATNA, BIHAR

3. English Language: The request for arbitration, the answer to the request, the terms of reference, any written submissions, any orders, and awards shall be in English and, if oral hearings take place, English shall be the language to be used in the hearings. The award shall be made in writing.

4. Enforcement of Award: The Parties agree that the decision or award, which shall be a speaking order, resulting from arbitration shall be final and binding upon the Parties and shall be enforceable in accordance with the provision of the Arbitration and Conciliation Act 1996 subject to the rights of the aggrieved parties to secure relief from any higher forum.

5. Performance during Arbitration: The Arbitration Proceedings shall be governed by Indian Arbitration and Conciliation Act 1996, as amended from time to time including provisions in force at the time the reference is made. Pending the submission of and/or decision on a Dispute and until the arbitral award is published; the Parties shall continue to perform their respective obligations under this Agreement without prejudice to a final adjustment in accordance with such award. The courts at PATNA shall have the sole exclusive jurisdiction to try all the cases arising out of this agreement.

6. Notices: That any notice under the terms of this License shall be in writing by registered post or delivered personally and signed by the party or his/its duly authorized representative giving such notice. All activities including day to day management, billing, termination etc. will be carried out from the office of the CLNU, PATNA.

SECTION-4

FORMS AND FORMATS

Annexure- "II"

ACCEPTANCE OF TENDER CONDITIONS

From: (On the letter head of the company by the authorized officer having power of attorney)

CNLU,

……

Sub: Name of the work & NIT No.:

Sir,

This has reference to above referred tender. I/We are pleased to submit our tender for the above work and I/We hereby unconditionally accept the tender conditions and tender documents in its entirety for the above work.

I/we are eligible to submit the tender for the subject tender and I/We are in possession of all the documents required.

I/We have viewed and read the terms and conditions of this GCC/SCC carefully. I/We have downloaded the following documents forming part of the tender document:

a. Notice Inviting Tender (pg.....to….pg-)
b. Instructions to Bidder (ITB) & Clauses of Contract (pg…….to….pg-)
c. Technical Specifications (pg…….to….pg-)
d. Bill of Quantities (BOQ)- (pg…….to….pg-)
e. Tender Drawings (pg…….to….pg-)
f. Acceptance of Tender Conditions
g. Corrigendum, if any (pg…….to….pg-)

Should this tender be accepted, I/We agree to abide by and fulfill all terms and conditions referred to above and as contained in tender documents elsewhere and in default thereof, to forfeit and pay CNLU, or its successors or its authorized nominees such sums of money as are stipulated in the notice inviting tenders and tender documents.

If I/we fail to commence the work within 10 days of the date of issue of Letter of Award and/or fail to sign the agreement as per Contract and/or fail to submit performance guarantee as per of Clauses of Contract, I/we agree that CNLU shall, without prejudice to any other right or remedy, be at liberty to cancel the Letter of Award and to forfeit the said earnest money as specified above.

Your faithfully,
(Signature of the Bidder with Rubber stamp)

Appendix - 'N"

FORM XXV

DETAILS OF THE BALANCE WORK IN HAND AS ON_____ (UPTO THE PRECEDING MONTH OF SUBMISSION OF BID) WITH CNLU

(To be submitted in Envelop-1)

S. No	Name of the Firm	Contract Value	Date of start as per LOI/ Contract	Date of completion as per LOI / Contract	Work done up to the preceding month of submission of bid	Balance value of work

Note: The bidder shall also include the value of all such works which are awarded to bidder but not started up to the preceding month of submission of bid.

Appendix – "0"

FORM XXVI AFFIDAVIT

(To be submitted by bidder on non-judicial stamp paper of Rs. 100/- (Rupees Hundred only) duly attached by Notary Public)

Affidavit of Mr. .....S/o……R/o.....
I, the deponent above named do hereby solemnly affirm and declare as under:
That I am the Proprietor/Authorized signatory of M/s……
Having its Head Office/Regd. Office at…….....

That the information/documents/Experience certificates submitted by M/s……. along with the tender for …… *(NAME OF WORK*) ……To CNLU Ltd. are genuine and true and nothing has been concealed.

I shall have no objection in case CNLU verifies them from issuing authority(ies). I shall also have no objection in providing the original copy of the document(s), in case CNLU demand so for verification.

I hereby confirm that in case, any document, information & / or certificate submitted by me found to be incorrect / false / fabricated, CNLU at its discretion may disqualify / reject / terminate the bid/contract and forfeit the EMD / All dues.

I shall have no objection in case CNLU verifies any or all Bank Guarantee(s) under any of the clause(s) of Contract including those issued towards EMD and Performance Guarantee from the Zonal Branch /office issuing Bank and I/We shall have no right or claim on my submitted EMD before CNLU receives said verification.

That the Bank Guarantee issued against the EMD issued by (name and address of the Bank) is genuine and if found at any stage to be incorrect / false / fabricated, CNLU shall reject my bid, cancel pre-qualification, and debar me from participating in any future tender for three years.

I, ..., the Proprietor/Authorised signatory of M/s..... do hereby confirm that the contents of the above Affidavit are true to my knowledge and nothing has been concealed and that no part of it is false.
Verified at ..... this..... day of .....

DEPONENT

ATTESTED BY

(NOTARY PUBLIC)

PROFORMA OF BANK GUARANTEE (PERFORMANCE)

(Judicial Stamp paper of appropriate value as per stamp Act-of respective state)

Whereas the CHANAKYA NATIONAL LAW UNIVERSITY, (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to M/s …….. with its Registered/Head Office at …… (hereinafter referred to as the "Contractor" which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract by issue of Employer's Letter of Award No. …….. dated ……. and the same having been acknowledged by the Contractor, resulting in a Contract, bearing No. …… dated …… valued at …… for …….. (scope of Contract) and the Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract equivalent to …….. * ……. (%) ……. per cent) of the said value of the Contract to the Employer.

We ……

(Name & Address)

having its Head Office at …… (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer on demand any and all monies payable by the Contractor to the extent of …….. as aforesaid at any time upto and including …… ** ……. (days/month/year) without any demur, reservation, context, recourse or protest and/or without any reference to the Contractor.

Any such demand made by the Employer on the Bank shall be conclusive and binding not withstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Employer and further agrees that the guarantee herein contained shall continue to be enforceable till the Employer discharges this guarantee.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from time to time to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the

matters aforesaid or any of them or by reason of any other act of omission or commission on the part of the Employer or any other indulgences shown by the Employer or by any other matter or thing whatsoever which under law would, but for this provision have the effect of relieving the Bank.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee the Employer may have in relation to the Contractor's liabilities.

Notwithstanding anything contained hereinabove our liability under this guarantee is restricted to …….. and it shall remain in force upto and including …… and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/s …….. on whose behalf this guarantee has been given.

Dated this …….. day of …… 20 …..…….at ……..

WITNESS

……	……
(Signature)	(Signature)
……..	……
(Name)	(Name)
……	……
(Official Address)	(Designation with Bank Stamp)
	Attorney as per Power of Attorney No. _____
	Date: _____

NOTES:

1. <u>The stamp papers of appropriate value shall be purchased in the name of issuing Bank.</u>

AGREEMENT FORM

This agreement made on day of DD-MM-YY, between the CHANAKYA NATIONAL LAW UNIVERSITY, (hereinafter referred to as the "CNLU" which expression shall include its administrators, successors, executors and assigns) of the one part and M/s…….(hereinafter referred to as the "Contractor" which expression shall unless the context requires otherwise include its administrators, successors, executors and permitted assigns) of the other part WHEREAS, CNLU, has desirous of ……under required work (hereinafter referred to as the "PROJECT") had invited tenders as per tender documents vide Tender No……. AND WHEREAS M/s ……. And Contractors had participated in the above referred tender vide their tender opened on DD.MM.YY and CNLU has accepted their aforesaid tender and issued Letter of Intent for ..... on the terms and conditions contained in its Letter of Intent No. Ref. ……. Date.DD.MM.YY and the documents referred to therein, which have been unequivocally accepted by M/s ……vide their acceptance letter along with performance bank guarantee dated DD.MM.YY resulting into a contract. NOW THEREFORE THIS DEED WITNESSETH AS UNDER:

ARTICLE 1.0 – AWARD OF CONTRACT

SCOPE OF WORK CNLU has awarded the contract to M/s …… for the work of ……
on the terms and conditions in its Letter of Intent No. Ref. …… PATNA, Date: DD.MM.YY and the documents referred to therein.
The award will take effect from the date of issue of work order. The terms and expressions used in this agreement shall have the same meanings as are assigned to them in the "Contract Documents" referred to in the succeeding Article.

ARTICLE 2.0 – CONTRACT DOCUMENTS

The contract shall be performed strictly as per the terms and conditions stipulated herein and in the following documents attached herewith (hereinafter referred to as "Contract Documents"). CNLU Notice Inviting Tender No……CNLU's tender documents consisting of:

Section 1 to 3: NIT, Intstruction to Bidder and Clauses of Contract
Section 5: Scope of Work and Special Conditions of Contract
Section 6: Technical Specification
Section 7: Drawing
Section 8: Bill of Quantity
Letter of Intent Ref. No ..... /CNLU/PATNA, Date: …….. ISSUED BY CNLU

Acceptance letter and performance guarantee submitted by M/s …….
All the aforesaid contract documents referred to in Para above shall form an integral part of this Agreement, in so far as the same or any part thereof column, to the tender documents and what has been specifically agreed to by CNLU in its Letter of Intent. Any matter inconsistent therewith, contrary, or repugnant thereto or deviations taken by the Contractor in its "TENDER" but not agreed to specifically by CNLU in its Letter of Intent, shall be deemed to have been withdrawn by the Contractor without any cost implication to CNLU. For the sake of brevity, this Agreement along with its aforesaid contract documents and work order (Letter of award) shall be referred to as the "Contract".

ARTICLE 3.0 – CONDITIONS & CONVENANTS

The scope of Contract, Consideration, terms of payments, advance, security deposits, taxes wherever applicable, insurance, agreed time schedule, compensation for delay and all other terms and conditions contained in contract document and CNLU's Letter of award (Work order) are to be read in conjunction with other aforesaid contract documents. The contractor shall duly perform the contract strictly and faithfully in accordance with the terms of this contract. The scope of work shall also include all such items which are not specifically mentioned in the Contract Documents, but which are reasonably implied for the satisfactory completion of the entire scope of work envisaged under this contract unless otherwise specifically excluded from the scope of work in the Letter of Intent. Contractor shall adhere to all requirements stipulated in the Contract documents. Time is the essence of the Contract and it shall be strictly adhered to. The progress of work shall conform to agreed works schedule/contract documents and Letter of Intent. This agreement constitutes full and complete understanding between the parties and terms of the presents. It shall supersede all prior correspondence to the extent of inconsistency or repugnancy to the terms and conditions contained in Agreement. Only a written instrument shall affect any modification of the Agreement signed by the authorized representative of both the parties. The total contract price for the entire scope of this contract is item rate quoted by M/s ……. Totaling to Rs.
……. which shall be governed by the stipulations of the contract documents.

ARTICLE 4.0 – NO WAIVER OF RIGHTS

Neither the inspection by CNLU or the Engineer-in- Charge or any of their officials, employees or agents nor order by CNLU or the Engineer-in- Charge for payment of money or any payment for or acceptance of, the whole or any part of the work by CNLU or the Engineer- in- Charge nor any extension of time nor any possession taken by the Engineer-in-Charge shall operate as waiver of any provisions of the contract, or of any power herein reserved to CNLU, or any right to damage herein provided, nor shall any waiver of any breach in the contract be held to be a waiver or any other or subsequent breach.

ARTICLE 5.0 – GOVERNING LAW AND JURISDICTION

The Laws applicable to this contract shall be the laws in force in India and jurisdiction of PATNA Court (s) only. Notice of Default Notice of default given by either party to the other party under the Agreement shall be in writing and shall be deemed to have been duly and properly served upon the parties hereto, if delivered against acknowledgment due or by FAX or by registered mail duly addressed to the signatories at the address mentioned herein above. IN W ITNESS W HEREOF, the parties through their duly authorized representatives have executed these presents (execution whereof has been approved by the Competent Authorities of both the parties) on the day, month and year first above mentioned at PATNA.

WITNESS:

1…… (Owner's Signature)
Printed Name

2. ……. (Designation)
Company's Stamp

1. ……. (Contractor's signature)
Printed name

2. …….. (Designation)
Company's stamp

SECTION-5

SCOPE OF WORK
&
SPECIAL CONDITION OF CONTRACT

SCOPE OF WORK

1. "Supply, Installation, Testing and commissioning of 33/.433 kV, 2x1600 kVA Oil type Indoor transformer Substation and other Electrical Works"

The scope of work covered in this tender shall be as per the Bill of Quantities, specifications, drawings, instructions, orders issued to the contractor from time to time during the pendency of work. The drawings for this work, which may be referred for tendering, provide general idea only about the work to be performed under the scope of this contract. These may not be the final drawings and may not indicate the full range of the work under the scope of this contract. The work will be executed according to the drawings to be released as "GOOD FOR CONSTRUCTION" from time to time by the Engineer-in- charge of CNLU and according to any additions/ modifications/ alterations/ deletions made from time to time, as required by any other drawings that would be issued to the contractor progressively during execution of work. It shall be the responsibility of the contractor to incorporate the changes that may be in this scope of work, envisaged at the time of tendering and as actually required to be executed.

The quantities of various items as entered in the "BILL OF QUANTITIES" are indicative only and may vary depending upon the actual requirement. The contractor shall be bound to carry out and complete the stipulated work irrespective of the variation in individual items specified in the bill of quantities. The variation of quantities will be governed as per clause given in tender document.

1. The contractor is to give the guarantee for One year against all installation and equipment defects.
2. The successful bidder needs to submit performance guarantee 3% (Three per cent) of the quoted price, which shall be released after completion of work and security deposit 3% (Three per cent), which will be released after completion of 1 year.

3. The Rate should be quoted including All taxes and GST nothing shall be paid extra except Quoted rates. (If any rise in tax or if new tax is imposed by central or State Govt, or any Govt authority after Tender the contractor is to bear the same).

4. All the Civil work Should be repaired with original material including coloring if any breakage or dismantling work is done during installation of the system, including cleaning of the site, for which no extra payment shall be made to the contractor.

5. The rates to be given for furnished complete work, all material, labor wastage, royalties, taxes, lease rent, scaffolding, transportation charges, breakage, making good any damage to wall, ceiling, fitting etc., to make the original finish including painting, transportation, replacement, of any defective material, theft, insurance, variation in market rates, removal of rubbish dismantled material, cleaning of site be included in the quoted rates.

6. The contractor is to arrange for storage of material & its Security arrangement During the installation & commissioning of work.

7. he contractor should submit the one-year defective part replacement guarantee, caused due to any reason.

8. The contractor will be fully responsible for any accident, damages, losses, that occurs during the installation & commissioning of work. No compensation will be made by the CNLU.

9. The contractor is to take all measures for safety and security for man & material and to follow all labor laws.

10. The Rates should be quoted for at site PATNA.

SPECIAL CONDITIONS OF CONTRACT (SCC)

GENERAL-

1.1. The following special conditions shall be read in conjunction with General conditions of contract. If there are any provisions in these Special Conditions, which are at variance with the provisions of General Conditions of Contract, the provisions in the Special Conditions shall take precedence.

1.2. Where any portion of Special Conditions of Contract is repugnant to or at variance with any provision of the instructions to Bidder and General Conditions of Contract and / or the other documents forming part of the contract then unless a different intention appears the provision of the Special Conditions of Contract shall be deemed to override the provisions of the general conditions of contract and / or the other documents forming part of the contract only to the extent such repugnant/various in the special conditions of contract as are not possible of being reconciled with the provisions in the special conditions of contract as are not possible of being reconciled with the provision with instructions to Bidder or General Conditions of contract and / or the other documents from part of the contract.

1.3. Working drawing shall be according to the drawing given in the Tender document.

1.4. Items mentioned in the BOQ may vary or any changes is needed then it should bring to the attention of CNLU.

1.5. Working drawings are given by CNLU in tender document; if any deviations found and correction required then it should be brought to CNLU for rectification.

1.6. The items which are missing or not defined in the given BOQ in this Tender Document then the contractor must submit the items for approval to CNLU.

1.7. The contractor must submit sample of the items defined in BOQ the same to be approved by CNLU, before use.

1.8. Internal wiring work should be done as per CPWD/CONCERNED STATE PWD Specifications.

1.9. Bidder must be submitted all kind of Testing reports related to material, commissioning, and installation, if desired by Engineeer-In-Charge.

SECTION-6

TECHNICAL SPECIFICATIONS & LIST OF APPROVED MAKES

CONTENTS

SECTION 1 GENERAL

1.1 SCOPE:

These general specifications cover the details of Sub Station Equipment (Transformers, HT Panels, and other related items) to be supplied, the inspection as may be necessary before dispatch, delivery at site, installations, testing, commissioning, putting into operation and handing over in working condition of the equipment for sub-stations for working voltage of 33000/433 volts. The general specifications are subject to revision from time to time. The tender specifications for a particular job shall clearly indicate the applicable version of these specifications.

1.2 CONFORMITY WITH STATUTORY ACTS, RULES, REGULATIONS, STANDARDS AND SAFETY CODES:

1.2.1 Indian Electricity Act and Rules:

All electrical works in connection with installation of electric sub-stations shall be carried out in accordance with the provisions of Indian Electricity Act, 2003 and the Indian Electricity Rules 1956 amended upto date. Wherever Indian Electricity rule numbers have been indicated, they are based on I.E., rules 1956 amended up to date.

1.2.2 CPWD Specifications:

The electrical works shall also conform to CPWD. General Specifications for Electrical Works Part I (Internal) 2013, Part IV (Sub Station) and Part II (External) 1994 as amended upto date wherever relevant and applicable.

1.2.3 Indian Standards:

The sub-station equipment and their installation shall conform to relevant Indian standards.

SECTION 2
HIGH VOLTAGE PANEL

2.1 SCOPE:

These specifications cover the detailed requirements for supply, installation, testing and commissioning of High Voltage Panels.

2.2 **TYPE OF PANELS**:

2.2.1 **Vacuum circuit breaker**.

2.2.2 **Gas filled Circuit Breaker**:

These breakers are new in the market and are being used for 33KV and above in power distribution. These may use on selective basis based on their availability, serviceability, and cost.

2.2.3 **Gas insulated compact Switchgears with Vacuum Circuit Breakers**. These are recently introduced and may be used in cases of space crunches judiciously. However, the discussions shall be limited to only Vacuum Circuit Breakers.

VACUUM CIRCUIT BREAKER

2.3 H.V. PANEL

2.3.1 The Panel board shall be of indoor type, having the incoming sectionalization and outgoing switch gears as per IS 13118-1991 of VCB, IEC 62271-100 for Breakers and -200 for Panels/IS 3427 of switch board. The degree of enclosure protection shall be IP-4X.

Detailed requirements shall be in accordance with the schedule of works at Appendix-II.

2.3.2 **Rating**:

All panels assembled to form a board shall be suitable for the nominal operation voltage and rupturing capacity as specified. They should be rated as specified with a minimum of rating as mentioned in BOQ. And suitable for operation on 33 KV, 3 phase 50 Hz system. Type test certificate for the breaking capacity of the panel shall be supplied. A circuit breaker for a given duty in service is best selected by considering the individual rated values required by load conditions and fault condition.

2.3.3 **Type**:

The HV panel Board shall be metal clad, indoor, floor mounting, free standing type. It shall be totally enclosed dust, damp, and vermin proof.

2.3.4 General Construction:

Separately earthed compartments shall be provided for circuit breakers, bus bars, relay & instruments, CT&PT, and cable boxes, fully and effectively segregating these from one another so that fault in any one compartment do not cause damage to equipment(s) in other compartment(s).

The housing shall be of bolted construction to ensure compact and rigid structure, presenting a neat and pleasing appearance. The sheet steel used should not be less than 2mm thick.

The panels shall be bolted together to form a continuous flush front switch gear suitable for front operation of board and for extension at both ends.

2.3.5 General Design Aspects:

The HV panel board shall be designed such that the switchgear, instruments, relays, bus bars, small wiring etc. are arranged and mounted with due consideration for the followings: -

- Facility for inspection, maintenance and repairs of testing terminals and terminal boards for ease of external connection.
- Minimum noise and vibrations.
  - Risk of accidental short circuits and open circuits.
  - Secured and vibration proof connections for power and control circuits.
- Risk of accidental contact and danger to personnel due to live connections.
- Mountings at approachable height.

2.4 CIRCUIT BREAKER:

2.4.1 General Arrangements:

The circuit breaker panels shall be complete with the following:

- Racking in / Racking out mechanism.
- Isolating plugs and sockets.
- Mechanical inter-locks and safety shutters.
- Mechanical ON/OFF indicator.
- Minimum of 4 NO and 4 NC Auxiliary contacts directly operated by the circuit breaker. Additional NO & NC contacts can be provided with auxiliary contactors.
- Anti-condensation space heaters suitable for operation on 240V, 50 Hz
  A.C. for each panel wherever specified.
- Suitable tripping arrangement
- Mechanical counter to assess the total number of operations of the breaker (if asked for specifically).

2.4.2 Type:

The circuit breaker shall be of horizontal/ vertical isolation, horizontal draw out pattern.

2.4.3 Breaker Truck:

The breaker carriage shall be fabricated from steel, providing a sturdy vehicle for the circuit breaker and its operating and tripping mechanism. The carriage shall be mounted on wheels, moving on guides, designed to align correctly and allow easy movement of the circuit breaker and for removing the carriage for inspection and maintenance purposes. Vacuum interrupters shall be hermetically sealed and shall be designed for minimum contact erosion, fast recovery of dielectric strength, maintenance free vacuum interrupter, suitable for auto-reclosing. The drive mechanism shall preferably be provided with facility for pad locking at any position namely, “Service”, “Test” and “Fully Isolated”. It should be possible for testing the circuit breaker for its operation without energizing the power circuit in the “Testing” position. The contacts shall be made only after the breaker is inserted into service position. Interlocking should prevent contacts from being disconnected if circuit breaker is tried to be moved from service position.

2.4.4 General Features:

Single break contacts are provided in sealed vacuum interrupter.

2.4.5 **Rating**:

The circuit breakers shall be continuously rated as specified with a minimum rated current as mentioned in BOQ. With voltage rating and breaking capacity as specified.

2.4.6 Operating Mechanism:

The operating mechanism shall be one of the following as specified: -

Manually operated spring charged / motor wound spring charged with both mechanical and electrical release for closing. The operating mechanism shall be trip free.

2.4.7 External auxiliary supply shall be made available for charging motors & heaters operation.

2.5 BUS BAR SECTION:

2.5.1 **General Requirement:**

The switch board shall be single bus bar pattern with air insulated encapsulated bus bars housed in a separate compartment, segregated from other compartments.

Material: The bus bars shall be of high conductivity electrolytic copper/ Aluminium as and rated as specified with a minimum rated current as mentioned in BOQ. The bus bars shall be sized for carrying the rated and short circuit current without over-heating. Maximum bus bar temperature shall not exceed 95-degree C.

2.6 CURRENT TRANSFORMER:

2.6.1 General Requirements:

Accommodation shall be provided in the circuit breaker panel to mount one set of three numbers dual core dual ratio CTs for metering and protection purposes. Access to the CTs for cleaning, testing, or changing shall be from the front, back or top of the panel.

2.6.2 Rating:

Dual core & dual ratio CTs of suitable burden (but not less than 15 VA) shall be preferred with 5 Amps secondary. The ratio shall normally be one of the following as specified and required at site.

Note: CT ratio shall be compatible with the loading pattern on HV side.

The CTs shall conform to relevant Indian Standards. The design and construction shall be robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitably to a terminal block which will be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5 P 10 of IS 2705-Part III-1992.

The metering CTs shall conform to the metering ratio and accuracy class 0.5 of IS 2705-1992 for incomer and class 1 for outgoing Panels.

2.7 VOLTAGE TRANSFORMER:

2.7.3 **General Requirements**:

A voltage transformer of burden not less than 100 VA and of proper ratio as specified shall be provided at the incoming panel.

The accuracy class for the VT shall be class 0.5 as per IS 3156 parts I to III for incomer and class 1 for outgoing Panels.

The transformer shall be of cast epoxy resin construction. It shall be fixed /withdraw able type. HRC fuses/MCBs shall be provided on both HV and LV sides.

2.8 PROTECTION AND TRIPPING ARRANGEMENT:

2.8.1 **Protection**:

The Relays shall be microprocessor based numerical relays with O/L, E/F and S/C protection Tripping relay shall be used for tripping signal to the Shunt Trip Coil of Circuit Breaker operating on 24V/30V D C supply / Power pack / 110 V VT supply.

Note: - 24V/30V DC shall be provided through 2 No. SMF batteries of 12/15 volts of minimum 26 AH capacity with a battery charger as per recommendation of the manufacturer both for protection as well as indications.

Alternatively, Power Pack converters fed through PT/230V externally could be provided with 2 Nos., 12/15-volt, 7 AH SMF batteries (Power pack with condenser / capacitor backup are also available which do not need batteries, these should not be used) for tripping. In cases where tripping is fed through PT, VA burden of PT shall be suitably increased (say 200 VA) as recommended by the manufacturer depending upon the number of panels and connected controls. In addition, external 24 volt / 30-volt DC supply shall be provided for indications etc. through 2 No. SMF batteries of 12/ 15 volts of minimum 26 AH capacity with a battery charger as per recommendation of the manufacturer.

2.8.2 **Relays**:

Over current Relays shall have adjustable setting for current from 50% to 200% and earth fault from 10% to 40% or 20% to 80%. These should be of manual reset type. All relays shall have a LED indicator which will indicate operation for each function. It shall be possible to reset it only by manual operation. The number and types of relays shall be as specified.

2.9 SMALL WIRING:

The small wiring shall be carried out with minimum1.5sq. mm FRLS/HFFR insulated copper conductor cables. CT wiring shall be done with minimum 2.5 sq mm wires with colour code: RYB, Gray for auxiliary DC circuits and Black for auxiliary AC circuits the wiring shall be securely fixed and artfully arranged to enable easy tracing of wires. Identification tags shall be fitted to all wire terminals to render identification easy and to facilitate checking in accordance with IS 375. Necessary terminal blocks and cable entries shall be provided for RTD relay wiring, power supply etc.

2.10 METERING INSTRUMENT, PANEL ACCESSORIES (DIGITAL):

2.10.1 **Metering**:

Energy metering shall be done either on the incomers or on the feeders as specified in Appendix II.

2.10.2 **Voltage Selection Scheme**:

Where a bus coupler is incorporated and only one incomer feeder (out of two available) is intended to be operated at a time, a VT Transfer Relay shall be incorporated to provide necessary potential for metering. This will be necessary when energy metering is done on individual feeders or where VT supply is used for trip circuits. Alternatively, PTs shall be provided on both the bus sections (incomers) with individual metering on each incomer.

2.10.3 **Instrument Panels**:

The instrument panel shall form part of the housing. Relays, meters, and instruments shall be mounted as per general arrangement drawings to be submitted by the tenderer. They shall be preferably of flush mounting type at a maximum height of 1800 mm.

2.10.4 **Instrumentation**:

- A voltmeter of class 1.5 accuracy as per IS-1248 shall be provided at each incomer panel, with selector switch. The instrument shall be calibrated for the ranges specified.
- Energy meters of class 1.0 conforming to IS. 722 (Part IX) and power factor meter of class of accuracy of 2 shall be provided, if specified.
- Ammeter of specified range of class 1.5 accuracy as per IS-1248 shall be provided at both incomer and outgoing panels along with necessary selector switches.
- The panel assembly shall also take care of the following requirements:
  (i) Lamp indication shall be provided to indicate ON/OFF (BY red, green respectively) of switch gear.
  (ii) Panel illuminating lamp.
- Mechanical indication for spring charged status. If possible, an indicating lamp could be provided.
- Lamp indicating tripping at fault status.
- Healthy trip supply shall be indicated by clear lamp.
- Separate fuses/MCBs shall be provided for lamps, heaters, voltmeters, and other instrumentation etc. on each panel.
- Anti-condensation space heaters shall be provided, and shall be suitable for operation on 240 V, 1 phase, 50 Hz A.C. for each panel if specified.
- Where there is more than one incomer and bus sections, these shall be castle key interlocked as per interlocking scheme as specified.

2.11 **CABLE BOXES**:

Cable boxes shall be situated in a compartment at the rear/ side of the housing as specified.

2.12 **CABLE ENTRY**:

Provision for top (bus ducts preferred for top entry) / bottom or such other side entry shall be made as per requirement with sufficient head room for cable termination. 3mm thick removable gland plate shall be provided for cable termination.

2.13 EARTHING:

The earthing of the breaker body and moving portion shall be so arranged that the earthing of the non-current carrying structure to the frame earth bar is

completed well before the main circuit breaker plugs enter the fixed house sockets.

The entire panel board shall have a common tinned copper earth bar of suitable section with 2 earth terminals for effectively earthing metallic portion of the panels. The frame earthing of panel shall be in accordance with Section 7 of this specifications.

2.14 INSTALLATION:

The installation work shall cover assembly of panels lining up, grouting the units etc. In the case of multi panels switch boards after connecting the bus bar all joint shall be insulated with HV insulation tape or with approved insulation compound. A common earth bar shall be run preferably at the back of the switch board connecting all the sections for connecting the earth system. All protection, indications & metering connections and wirings shall be completed.

Where trip supply battery is installed the unit shall be commissioned, completing initial charging of the batteries. All relay instruments and meters shall be mounted and connected with appropriate wiring. Calibration checks of units as necessary and required by the licensee like CTs, VTs Energy Meters etc. shall be completed before pre-commission checks are undertaken.

2.15 TESTING AND COMMISSIONING

Procedure for testing and commissioning of relay shall be in general accordance with good practice.

Commissioning checks and tests shall include in addition to checking of all small wiring connections, relays calibration and setting tests by secondary injection method and primary injection method. Primary injection test will be preferred for operation of relay through CTs. Before panel board is commissioned, provision of the safety namely fire extinguishers, rubber mats and danger board shall be ensured. In addition, all routine megger tests shall be performed. Checks and test shall include following.

- Operation checks and lubrication of all moving parts.
- Interlock function checks.
- Continuity checks of wiring, fuses etc. as required.
- Insulation tests.
- Trip test and protection gear tests.
- The complete panel shall be tested with 5000V megger for insulation between poles and poles to earth. Insulation test of secondary of CTs and VT to earth shall be conducted using 500V megger.
- Any other tests as may be required by the Licensee / Inspector shall be conducted.
- Where specified, the entire switch board shall withstand high voltage test after installation.
- Any other test required by the consignee/inspecting officer.

SECTION-3
TRANSFORMERS

3.1 SCOPE:

This section covers the detailed requirements regarding supply, installation, testing, commissioning, and handing over of transformers required for the sub- station.

Conventionally oil cooled transformers were being used for electrical substation. However due to presence of oil for cooling of transformers, an inherent fire risk is involved in the use of oil cooled transformers.

After repeated fire accidents due to burning of oil in oil cooled transformers, I.E. Rules have been amended to provide for use of only Oil type transformers where a substation is planned inside the main building while oil cooled transformers can continue to be used if the substation is in an independent building.

3.2 OIL COOLED TRASFORMERS:

3.2.1 General Construction:

The oil filled Transformers shall comply with the following Indian Standards as amended upto date:

- IS 2026 - Part I to V power transformers.
- IS 335 - Transformer oil
- IS 10028 (Part II & III) - Installation and Maintenance of Transformers.
- IS 2099 - Bushing
- IS 2705 – Current Transformers

3.2.2 IS 6600 – Guide for loading of oil immersed transformer Insulating Oil:

Insulation Oil Insulation oil shall conform to IS 335. Transformer oil to be supplied with initial fill of filtered oil.

3.2.3 General Requirements:

The transformer shall be indoor or outdoor type as specified. Unless otherwise specified the transformer in addition shall have thermal and dynamic ability to withstand external short-circuit as per clause 9 of IS 2026 (Part I) 1977.

3.2.4 Capacity and Rating:

The KVA ratings for three phase transformers is 1600 kVA. Continuous rating specified shall be irrespective of tapping position.

TEMPERATURE RISE

The reference ambient temperatures assumed for the purpose of this specification are as follows: -

(a) Maximum ambient air temperature 50 C.
(b) Maximum daily average ambient air temperature 40 C.
(c) Maximum yearly weighted average ambient temperature 32 C.
(d) Minimum yearly weighted average ambient temperature (-)5 C.

The temperature rises at the above conditions and at the altitude not exceeding 1000 meters shall be as follows: -

By resistance method 55 C (maximum temperature being 95 C). By thermometer 50 C.

If the site conditions indicated for a particular job is more severe than the refereed ambient temperature mentioned above, the temperature rise shall be suitably scaled down such that the hot spot temperature shall not exceed the values for the reference conditions.

3.2.5 Tap Changing Device:

Tap changing device shall be provided on H.V side, circuit type, externally hand operated with necessary indications for tap position and locking arrangement at any of the tapping positions. It shall be designed for bi- directional operation and shall be of self-positioning type and shall have the following steps: -

± 2.5% ± 5% -7.5% -10% (if required)

Note: Tap changing device shall be On Load Type.

3.2.6 Voltage Ratio:

Unless otherwise specified, the transformer shall be suitable for a voltage ratio of 33 KV/433 V.

VECTOR GROUP

For step down transformers, the winding connections shall conform to vector group dy11 unless otherwise specified.

3.2.7 Cooling:

Unless otherwise specified, the transformer shall be oil immersed natural air- cooled type (ONAN).

3.2.8 Accessories:

The transformer shall be a single tank type with termination on bushings or cable end box as specified both on HV and MV side. The MV side shall be suitable to receive cable inter-connection suitable for full load current of the transformer.

FITTINGS

The transformer shall be complete with the following fittings: -

(a) Oil conservator with oil level indicator, minimum level marking and drain plug for all transformers of capacity 50 KVA and above.

(b) On circuit type tap changer with position indicator and locking arrangement for all transformers.

- Thermometer pocket with plug:
- 100 mm dial type/stem type thermometer with metal guard Dial type thermometer may have max. temperature indicator and resetting device.
- Lifting lugs for all transformers.
- Bi-directional /Unidirectional Rollers to be specified.
- Rating diagram and terminal marking plate for all transformers.
- Explosion vent.
- Additional Neutral separately brought out on a bushing for earthing for all transformers.
- Earth terminals (2 Nos.) for body earthing for all transformers.
- Valves for filtration, drainage and filling etc. with necessary plugs for all transformers.
- Radiator assembly for all transformers.
- Silica gel breather for all transformers.
- Air release plug for all transformers.

- First filling of oil to IS 335/1993 including make-up fill during installation for all transformers.
- Facility to connect up Buchholtz relay.
- Inspection covers on tank cover for access to terminal connections for all transformers.
- Bushing terminations or cable box terminations as specified.
- Necessary hardware, clamps, lugs etc. for termination on HV/MV etc. for all transformers.

3.2.9 **Explosion Vent:**

Explosion vent or pressure relief device shall be provided of sufficient size for rapid release of any pressure that may be generated within the tank and which might result in damage to the equipment. The device shall operate at a static pressure less than the hydraulic test pressure for transformer tank. Means shall be provided to prevent the ingress of moisture and of such a design to prevent gas accumulation.

3.2.10 **Accommodation for auxiliary apparatus:**

Where specified, such as, for restricted earth fault protection, facilities shall be provided for the mounting of a neutral current transformer.

RATINGS AND DIAGRAM PLATES

The following plates shall be fixed to Transformer in a visible position.

- A rating plate of weatherproof material bearing the data specified in the appropriate clauses of IS: 2026/1977.
- A diagram plate showing the internal connection and the voltage vector relationship of the several windings in accordance with IS: 2026-1977 and a plan view of the transformer giving the correct physical relationship of the terminals.

3.2.11 Joints and Gaskets:

All gaskets used for making oil tight joints shall be of proven material such as granulated cork bonded with synthetic rubber gaskets or synthetic rubber or such other good material.

GAS AND OIL ACTUATED (BUCH HOLTZ) RELAYS

Buchholtz Relay shall be provided. The design of the relay mounting arrangements, the associated pipe work shall be such that mal operation of the relays shall not take place under normal service. The pipe work shall be so arranged that all gas arising from the transformer shall pass through the gas and oil-actuated relay. The oil circuit through the relay shall not form a delivery path in parallel with any circulating oil pipe, nor shall it be tied into or connected through the pressure relief vent, Sharp bends in the pipe work shall be avoided.

All wiring connections, terminal boards, fuses, and links etc. connected with gas actuated relays shall be suitable for tropical atmosphere. Any wiring liable to be in contact with oil shall have oil resistant insulation and the bared ends of stranded wire shall be sealed together to prevent seepage of oil entering connection boxes used for cables or wiring.

3.2.12 Cable Box:

Cable box shall not be mounted on the tank covers. It shall be feasible to remove the tank covers for inspection during maintenance etc. without recourse to breaking the joints or disturbing the cables already terminated. Necessary removable links in oil approachable through inspection cover in tank cover etc. after lowering oil shall be provided for test purpose.

3.2.13 Parallel Operation:

For parallel operation of transformers, the transformers shall have the same percentage impedance, same voltage ratio, same vector group, phase sequence etc.

3.2.14 Tests:

3.2.14.1 Tests at Works:

All routine and other tests prescribed by IS 2026 shall be carried out at the manufacturer's works before dispatch of the transformer in the presence of inspecting officer if required. Copies of the test certificates shall be furnished to the department. In addition to the prescribed routine tests, temperature rise test shall be invariably done on one transformer of each design. A copy of the impulse test certificate done on the same type/ design of the transformer shall be furnished in accordance with IS for purpose of record. If no impulse test was done in an earlier unit of the same design and capacity, one transformer will be subjected to impulse test in consultation with the Inspector at the firm's cost.

Copies of the certificates for pressure test, test for bushings, and type test for short circuit shall be supplied to the Department.

3.2.14.2 Tests at Site:

In addition to tests at manufacturer's premises, all relevant pre-commissioning checks and tests conforming to IS code of practice No.10028 (Part II & III) shall be done before energization. The following tests are to be particularly done before cable jointing.

- Insulation test between HV to earth and HV to MV with 5000 volts Megger.
- Insulation test between MV to earth with 500 volts Megger.
- Di-electric strength Test on oil.
- Buchholtz relay operation by simulation test when fitted.

All test results are to be recorded and reports should be submitted to the department.

3.2.15 Installation and Commissioning:

3.2.15.1 The transformer shall be installed in accordance with IS 10028 (Part II & III)-Code of practice for Installation and maintenance of transformer. Necessary support channels shall be grouted in the flooring.

3.2.15.2 The Transformer shall be moved to its location and shall be correctly positioned. Transformer wheels shall be either locked or provided with wheel stoppers. All parts of the transformers which are supplied loose, such as conservator, radiator banks, Buchholtz relay, dial thermometer, bushing etc. shall be fitted on the transformer. Transformer oil supplied in drums shall be topped up into the

transformer after duly testing/filtering upto the correct level required.

3.2.15.3 Wiring of devices such as Buchholtz relay, dial thermometer etc. shall be carried out as per drawings, earthing of neutral and body of the transformer shall be done in accordance with section (7) of these specifications.

3.2.15.4 Drying out of transformer winding will be necessary when the di-electric strength of the oil is lower than the minimum value as per IS-10028 or the transformer has not been energized within 6 months of leaving the works or where the radiator assembly is done at site. The transformer shall be dried out by one of the methods specified in IS - 10028. Drying out with centrifugal or vacuum type filters will, however, be preferred. The contractor shall carry out the process of drying without interruption and shall maintain a log sheet indicating time, oil temperature and insulation resistance.

3.2.15.5 After complete drying out of the transformer, oil sample shall be collected by the contractor and shall be tested for dielectric strength as specified in IS:335-1993 with approved test kit.

3.2.15.6 All devices such as dial type thermometers, Buchholtz relays and main alarm and trip contacts shall be checked for satisfactory operation.

3.2.15.7 All tests specified in 3.2.14 of these specifications shall be carried out by the contractor in the presence of inspecting officer/consignee free of cost.

3.2.16 Maximum Allowable Distribution Transformer Losses:

Distribution transformers of the proper ratings and design must be selected to satisfy the minimum acceptable efficiency at 50% and full load rating. The same shall be as per latest BIS.

3.2.17 Guaranteed Technical Data:

Guaranteed technical particulars shall be supplied vide Schedule 'C' of Appendix III.

SECTION 4 - M.V. PANELS

4.1 SCOPE:

This Section covers the detailed requirements of medium voltage switch Panel for 433V, 3 phase 50Hz 4 wire system. These shall be branded and/or assembled/ fabricated from a factory of repute. All switchgears shall be fully rated at an ambient of 40C.

4.2 TYPE OF PANEL:

The medium voltage switch board panel shall comprise of any one of the following types of switchgears or combination thereof as specified.

(a) Air Circuit breakers draw out or fixed type.

(b) MCCBs of suitable Ics ratings. MCCBs shall invariably be Current Limiting type. Features like Double Break, Positive Isolation functions shall be preferred.

The Panel shall be indoor type having incoming sectionalization and outgoing switchgears as specified. The design shall be cubical type. The degree of enclosure protection shall be IP 42 as per IS:13947 (Part-I).

4.3 M.V PANEL:

4.3.1 General Construction:

The switchboard shall be floor mounted free standing totally enclosed and extensible type. The switch board shall be dust & vermin proof and shall be suitable for the climate conditions as specified. The design shall include all provisions for safety of operation and maintenance personnel. The general construction shall conform to IS: 8623/1993 for factory assembled switch board.

4.3.2 Cubical Type Panels:

4.3.2.1 Cubical type panels shall be fabricated out of sheet steel not less than 2.0 mm thick. Wherever necessary, such sheet steel members shall be stiffened by angle iron framework. General construction shall employ the principle of compartmentalization and segregation for each circuit. Unless otherwise approved, incomer and bus section panels or sections shall be separate and independent and shall not be mixed with sections required for feeders. Each section of the rear accessible type of panel shall have hinged access doors at the rear. Overall height of the panel shall not exceed 2.4 meters. Operating levers handle etc. of highest unit shall not be higher than 1.7 meters. Multi-tier mounting of feeder is permissible. The general arrangement for multi-tier construction shall be such that the horizontal tiers formed present a pleasing and aesthetic look. The general arrangement shall be approved before fabrication. Cable entries for various feeders shall be either from top or bottom. Through cable alleys located in between two circuit sections, either in the rear or in the front of the panel. All cable terminations shall be through gland plates. There shall be separate gland plate for each cable entry so that there will not be dislocation of already wired circuits when new feeders are added. Cable entry plates shall therefore be

sectionalized. The construction shall include necessary cable supports for clamping the cable in the cable alley or rear cable chamber.

Cubicle panels with more than 1000 Amps BUS shall be made of tested structural modular sections.

4.3.2.2 **Bus Bar and Connections**:

The bus bars shall be of Copper/Aluminium of high conductivity electrolytic quality and of adequate section. Current density shall not exceed 160 amps for Copper /sq. cm. or 130 Amps for Aluminium/sq.cm. The bus bar system may comprise of a system of main horizontal bus bars and ancillary vertical bus bars run in bus bar alleys on either side of which the circuit could be arranged with front access cable entries. In the case of rear access, horizontal bus system shall run suitably either at the top or bottom. All connections to individual circuits from the bus bar shall preferably be solid connections; however flexible connections shall also be permitted as per recommendations of the Panel Manufacturer. All bus bars and connections shall be suitably sleeved / insulated in approved manner.

4.3.2.3 Incomer / Termination:

Incomer termination shall be suitable for receiving bus trunking /underground cables. Cable terminations shall invariably be through terminal blocks (Polyamide or superior) or brought out solid terminals.

4.3.2.4 Instruments:

All voltmeters and ammeters shall be flush mounted of size minimum 96mm conforming to class 1.5 of IS:1248 for accuracy. All voltmeters shall be protected with MCB.

4.3.2.5 Indicating Lamps:

On all the incomers of M.V panels, ON/OFF indicating LED lamps shall be provided and shall be suitable for operation on AC supply. Phase indicating LED lamps shall be associated with necessary ON/OFF toggle switch.

4.3.2.6 Small Wiring

All small wiring for Controls, Indication etc. shall be of with suitable FRLS/HFFR (halogen free fire retardant) copper conductor cables. Wiring shall be suitably protected within switch board. Runs of wires shall be neatly bunched, suitably supported and clamped. Means shall be provided for easy identifications of the wires. Where wires are drawn through steel conduits, the works shall conform to CPWD General Specifications for Electrical works (Part I- Internal) - 2013 and IS:732. Identification ferrules shall be used at both ends of the wires. All control wiring meant for external connections are to be brought out of terminal board.

4.4 OPERATIONAL REQUIREMENTS:

The indoor type MV panel shall conform to the following: -

(a) The panel shall comprise of incomers, outgoing feeders and bus coupler as specified. The incomer shall be either a double break / contact repulsion MCCB or an Air Circuit Breaker. The bus coupler shall be either a circuit breaker or a double break / contact repulsion

MCCB or switch disconnector fuse unit as specified. The outgoing feeders shall be circuit breakers/MCCBs as specified.

(b) The entire switch panel shall be cubical type generally conforming to IS:8623/1993 for factory assembled switch board.

(c) The incomer panel shall be suitable for receiving bus trunking or MV cable of size specified either from top or from bottom.

(d) All incoming AIR CIRCUIT BREAKER/MCCB shall have suitable adjustable tripping current and the time delay settings.

(e) The entire panel shall have a common earth bar of size as specified with two terminals for earth connections.

4.5 Rating and Requirements:

4.5.1 Air Circuit Breaker:

All Air Circuit Breakers shall be 3/4 pole with minimum 50 KA breaking capacity (35 MVA at 433V) conforming to IS: 13947 (Part-II). Rated current shall be as per capacities specified. The equipment shall be complete with the following: -

(a) Necessary circuit breaker carriage with 3 position (isolate, test, service) draw-out mechanism.

(b) Necessary isolating plugs and sockets.

(c) Necessary mechanism interlock and automatic safe shutters gear with arrangement for pad locking.

(d) Necessary independent manual spring mechanism with mechanical on/Off indication as well as electrical on/Off indication.

(e) Necessary bus bars with bolted type neutral links.

(f) ACB shall be provided with microprocessor-based releases having built in overload, short circuit & earth fault protection. Microprocessor release shall be EMI (electromagnetic induction)/EMC (electromagnetic compatible) certified.

(g) Necessary set of auxiliary switches.

(h) Necessary set of CTs with ratios as specified.

(i) Necessary identification, metering requirements as specified i/c. ON/ OFF indication lamps, selector switches, fuses, ammeter, voltmeter etc.

(j) In case of 4 pole breaker neutral shall be fully rated with adjustable settings from 50% to 100% of In.

(k) ACB terminals shall be suitable/suitably brought out for direct aluminum termination as per IS 13947 Part-II.

4.5.2 MCCB:

MCCB: All MCCBs shall be current limiting type with features of load line reversibility and suitable for Horizontal/Vertical mounting without any derating. Beyond 300Amps capacity MCCBs shall have positive isolation and preferably double break / contact repulsion & double insulation features. The MCCBs shall invariably be used with terminal spreaders.

4.6 TEST AT MANUFACTURERS WORK:

All routine tests shall be carried out and test certificates produced to the department.

4.7 INSTALLATION:

The installation work shall cover assembly of various sections of the panels lining up, grouting the units etc. In the case of multiple panel switch boards after connecting the bus bars etc., all joints shall be insulated with necessary insulation tape or approved insulation compound. A common earth bar as per section 7 of these specifications shall be run inside at the back of switch panel connecting all the sections for connection to frame earth system. All protection and other small wirings for indication etc. shall be completed before calibration and commissioning checks are commenced. All relays, meters etc. shall be mounted and connected with appropriate wiring.

4.8 TESTING AND COMMISSIONING

Commissioning checks and tests shall include all wiring checks and checking up of connections. Relay adjustment/setting shall be done before commissioning in addition to routine Megger tests. Checks and tests shall include the following:

a) Operation checks and lubrication of all moving parts.
b) Interlock function checks.
c) Continuity checks of wiring, fuses etc. as required.
d) Insulation test: When measured with 500V Megger the insulation resistance shall not be less than 100 mega ohms.
e) Trip tests and protection gear test.

SECTION 5
CABLE WORKS

This section covers supply, laying and jointing as required and testing and energizing all cable work.

5.1 SPECIFICATION OF CABLE:

5.1.1 33 KV grade XLPE insulated PVC sheathed armored Aluminum/Copper cable shall be 3 cores earthed of sizes as specified. The cable shall conform to IS-1554, Part II.

5.1.2 1.1 KV grade XLPE insulated PVC sheathed armored Aluminum / Copper cable shall be 3 ½ /4 core of sizes as specified. The cable shall conform to IS:1554 Part I.

5.1.3 All control wires shall be 650V grade copper conductor Halogen free fire retardant or FRLS PVC insulated, conforming to IS:1554 Part I. The minimum size of the control wires shall be 1.5 sq. mm.

5.2 INSTALLATION:

Cable shall be laid in ground, trenches, cable trays and on walls as specified. Installation shall include all supports and clamps as required. The complete work shall be in accordance with CPWD General Specifications for Electrical works - Part II (External) 1994 amended upto date. As far as possible cables shall not be fixed on walls directly but laid on cable trays.

5.3 JOINTING FOR 33 KV GRADE CABLE GLANDS:

Jointing work shall be carried out only by licensed experienced cable jointer and shall be in accordance with CPWD General Specifications for Electrical works - Part II (External) 1994 amended upto date.

5.4 EARTHING FOR 33 KV GRADE CABLE GLANDS:

All HV cable glands shall be connected to the earth with 2 Nos. 38.6 mm copper or equivalent.

5.5 Selection shall be made as per tables given under table-V of CPWD General Specification for Electrical Works Part-II (External)- 1994 amended upto date.

5.6 TESTING:

Testing of the complete cable installation shall be as per clause 2.8.2 and 2.8.3 of CPWD General Specifications for Electrical works - Part II (External) 1994 amended upto date.

5.7 POWER DISTRIBUTION SYSTEM LOSSES:

The power cabling shall be adequately sized as to maintain the distribution losses not to exceed 1% of the total power usage. Record of design calculation for the losses shall be maintained.

The cables be designed as per the voltage drop regulations at peak load, and the losses be calculated based on the assessed load during the day, week and year and should not be limited to the peak load.

SECTION 6
BUS TRUNKING

6.1 SCOPE

This section covers manufactures, supply installation, testing and commissioning of enclosed type bus ducts indoor type tor connection between the Transformer and MV panels. Bus Trunking shall be used for all substations to capacity 500 KVA and more. These may be used even for smaller sub- stations judiciously.

6.2 SANDWITCH INSULATED BUS- TRUNKING AND RISING MAINS

1. SUPPLY VOLTAGE

For 3 phase, 4 wire, 50 cycles AC supply, operation voltage 415/440 volts.

2. STANDARD FOR COMPLIANCE

IS : 8623/1993 I &II and IEC 61439 / I & II.

3. CONSTRUTION

The enclosure will be made from 16 SWG GI/ CRCA sheet steel powder coated to shade RAL 7032 (or such other shade). Bus bars would be in 'Sandwich' construction and the conductors will be individually insulated with 4 layers of insulation film. Inner layer will be of glass MICA and outer layer of polyester material Class 'F'. Alternatively extrusion of Class 'F' material in form of epoxy insulation may be provided. No drilling of bus bars is permitted. Aluminium conductors will be of 19501 grade and copper conductor of 99.9% purity and ETP grade with radialised edges. Length of section will be limited to max 3 Mtrs. Bus bars of one section will be connected to bus bars of adjacent section by uniblock joint system removable as separate sub-assembly, So that it can inserted or removed without disturbing the adjacent sections.

Installation: Normally manufacturer's recommendations should be followed.

For installation as Rising Mains / Vertical installation, at each floor, a set consisting of two Spring Hangers will be provided for fixing it on channels grouted in wall. At the start of run, Hangers without springs may be used for rigid support. In addition Horizontal supports will be provided (2 Nos. per floor) to hold bus bars in position. On Rising Mains, on front face of the bus bar trunking tap off points will be provided for inserting plug in boxes.

Number of tap off points at each floor will be as per requirement given in BOQ but minimum distance between tap off points may be kept around 500mm. Each Tap off opening will be closed by insulated shutters forming part of BBT, when not occupied by Plug in Boxes. Neutral cross section will be same as phase cross section.

Enclosure will be tested for protection degree IP – 54.

Necessary Vertical / Horizontal bends / Tees will be provided as required by layout.

Bus bars turnking will be rigidly fixed to the side walls or suspended from ceiling by supports as per requirement detailed in the layout.

At the termination either on the transformer side or on generator end or on switchgear panel, busduct will be provided with flange ends, adopter Box and copper flexible (preferably multispeed types) to connect Bus bars of bus duct to busbars of switchgear panel or transformer terminals or generator terminals.

All the components like Busbar ducting, Bends, hanger ends, Adopter Boxes etc. will be made from CRCA or GI sheets. Two earth strips of copper or aluminum of size as mentioned in IEC 60439, dependent on short circuit withstand capacity required will be provided throughout the length.

Expansion units are to be installed after every uninterrupted run of 50 MtrsFor composite expansion of complete Bustrunking run.

4. TECHNICAL PARAMETERS FOR COMPLIANCE:

a. Bus trunking will be designed to withstand short circuit current for one second.
b. Bus bar system should be designed for an ambient temperature of 40 deg. C and temperature rise restricted to 55 Deg. C max above ambient on conductors above ambient. Temperature rise of the enclosure 40 deg. C maximum. Temperature rise at terminals 70 Deg. C max.
c. Maximum operating voltage = 1000 Volts. (600 Volts).
d. Insulation voltage = 1000 Volts.
e. Bus trunking will be suitably chosen to give permissible voltage drop.
f. Rated impulse withstand voltage 12 KV at 1000 V (600 Volts).

5. PLUG IN BOXES

Plug in Boxes will be of draw out type. Contacts will be of silver plated copper and spring loaded. Earth connection will be the first to make and last to break during insertion and withdrawal. Plug in Box will be made from 1.6mm CRCA sheet steel powder coated or GI. Inside the plug in Boxes MCCB or SFU with fuses will be located as per requirements. The operation handle will be interlocked with plug in Box cover so that MCCB can be operated only with suitable cover in closed position. If required the plug in Box will be
interlocked with Bus bar trunking so that it can not be inserted or removed with the plug in Box lid opened. MCCB / SFU will be of 4 pole type unless otherwise specified in BOQ. Short circuit breaking capacity of MCCB in PIB should preferably be same as short circuit withstand for one second of Bus Bar Trunking.

6. LIST OF TEST TO BE CARRIED OUT

Type Tests: Copies of the following certificates should be submitted.

1. Verification of Temperature Rise limits.
2. Verification of dielectric properties.
3. Verification of short circuit strength.
4. Verification of degree of protection.

7. ROUTINE TESTS

1. Verification of insulation. Resistance.
2. Inspection of assembly, interlocks, locks etc.
3. Check on wiring if provided.
4. Dielectric test.

SECTION 7
EARTHING SYSTEM

7.1 SCOPE:

This section covers the general requirements of the earthing system for Sub-station installation. G.I. plate earthing with G.I. strip for sub-stations of 500 KVA capacity and copper plate earthing for sub-stations of higher capacity shall preferably be used.

7.2 SYSTEMS:

Earthing system shall comprise earth electrodes in accordance with clause 8.2.1 of General specifications for Elect. Works (part I Internal) 2013. For every additional transformer 2 more separate and distinct earth electrodes shall be provided for neutral earthing. The body earthing for transformers, HV & MV panels shall be done to a common earth bus connected to two separate and distinct earth electrodes.

Note: For a single transformer Sub-station, the total number of earth electrodes shall be 4 (2 for neutral and 2 for connection to a common earth bus for body earthing). For a two transformer sub- station total number of earth electrodes shall be 6 (4 for neutral earthing, two each for two transformers, and 2 for connection to a common earth bus for body earthing).

7.3 ELECTRODES:

The earth electrodes shall be as per CPWD General Specifications for Electrical Works (Part I Internal) 2013.

7.4 LOCATION OF EARTH ELECTRODES:

Normally an earth electrode shall not be situated less than 1.5m from any building. Care shall be taken that the excavation of earth electrode may not affect the column footings or foundation of the building. In such cases electrodes may be farther away from the building.

The location of the electrode earth will be a place where the soil has reasonable chance of remaining moist. As far as possible, entrances, pavements, and roadways, are to be avoided for locating the earth electrode.

7.5 WATERING ARRANGEMENT:

Method of watering arrangement shall comply with CPWD general specifications.

7.6 SIZE OF EARTH LEAD

The recommended sizes of copper earth bus lead in case of sub-stations shall be accordance with clause 8.2.2 of general specifications for electrical works (Part – I Internal) 2013 amended upto date. The minimum size of earth lead shall be 25 mm x 5 mm copper of equivalent GI strip.

7.7 INSTALLATION:

All joints shall be riveted and sweated. Joints in the earth bar shall be bolted and the joints faces tinned. Where the diameter of the bolt for connecting earth bar to apparatus exceeds one quarter of the width of the earth bar, the connection to the bolt shall be made with a wider piece of flange of copper jointed to earth bar. These shall be tinned at the point of connection to equipment and special care taken to ensure a permanent low resistance contact to iron or steel. All steel

bolts, nuts, washers etc. shall be cadmium palated, main earth bars shall be spaced sufficiently on the surface to which they are fixed such as walls or the side trenches to allow

for ease of connections. Copper earthing shall not be fixed by ferrous fittings. The earthing shall suitably be protected from mechanical injury by galvanized pipe wherever it passes through wall and floor. The portion within ground shall be buried at least 60 cm deep. The earthing lead shall be securely bolted and soldered to plate or pipe. In the case of plate earthing the lead shall be connected by means of a cable socket with two bolts and nuts. All washers shall be of the same materials as the plate or pipe. All iron bolts nuts and washers shall be galvanized.

7.8 TESTING:

After installation, the tests as specified in CPWD General Specifications for Electrical work (Part I Internal) 2013 shall be carried out and results recorded.

SECTION 8
POWER FACTOR IMPROVEMENT

8.1 SCOPE:

This section covers the specification for supply. Installation, testing and commissioning of 433 volts, 3 phase, 50 Hz capacitor banks and other such devices.

8.2 REQUIREMENTS:

Capacities of the capacitor banks/RLC panels shall be indicated in the BOQ.

8.3 CONSTRUCTION:

8.3.1 The capacitor bands shall generally conform to IS: 13341-1992, 13340-1993.

8.3.2 The capacitor units shall be indoor type, air – cooled with low viscosity impregnated paper dielectric hermitically sealed. The impregnation used shall be non- inflammable, non- oxidizing, lower freezing point type synthetic compound. Each individual cell shall be provided with pressure sensitive disconnectors / devices.

8.3.3 Main connections from the active element shall be brought out through porcelain bushing. Care shall be taken to solder the bushing to the cover to ensure perfect hermetic sealing.

8.3.4 Capacitor units shall be provided with externally mounted discharge resistors to reduce the residual voltage to less than 50 volts in one minute of switching off.

8.3.5 Individual unit shall be provided with HRC fuses/ adequate capacity of MCBs/MCCBs, contactors (capacitor duty) bus bars and terminal chambers to make bank of required KVAR. Terminal chamber shall be suitable for bottom/top cable entry. Two earth terminals shall be provided to each capacitor bank.

8.4 TESTS AT MANUFACTURERS WORK

All routine and type tests as per IS: 2834 relevant to capacitor banks as amended upto date shall be carried out at manufacturer's works and test certificates shall be furnished to the department.

8.5 INSTALLATION

Capacitor banks shall be installed at least 30cm away from the walls on suitable metal framework of welded construction. The earth terminals provided on the body of capacitor bank shall be bonded to the main capacitor panel earth bus with 2 Nos. 8 SWG copper or 6 SWG GI earth wires.

8.6 TESTS AT SITE

Insulation resistance with 500V DC Megger shall be carried out test results recorded.

SECTION 9
INTERNAL

9.0 GENERAL

The Internal Electrical works shall be carried out in accordance with Indian Standard Code of Practice for Electrical Wiring Installation IS: 732-1989 and IS: 2274-1963. Electrical Installation work shall also be in conformity with National Electrical Code with up to date amendments. All Electrical work shall be carried out in accordance with the provision of Indian Electricity Act 2003 & Indian Electricity Rules 1956 amended up to date. The work shall also conform to Indian Standard Code of Practice for the type of work involved. It shall also be in conformity with regulations and requirements of the Local Electricity Supply Authority and Fire Insurance regulations so far as these become applicable to the installation. Internal Electrical work shall be carried out as per part I CPWD general Specifications for Electrical Works.

Wherever this Tender Specifications call for a higher standard of material and or workmanship than those required by any of the above mentioned regulations and specifications then the particular specifications given here under shall take precedence over the said regulations and standards.

The work shall be executed and measured as per the dimensions given in the Bill of Quantities. Drawings, Designs, Specifications etc. The abbreviations used shall mean as under :-

//	-	Inch (25.4mm)
/	-	Foot (12 inches or 30.48 cms)
Sq.Ft.	-	Square Feet
Sq.Mt (M^2)	-	Square Metre.
Cu. Ft.	-	Cubic Feet.
Cum (M^3)	-	Cubic Metre.
Kg.	-	Kilograms (Equivalent to 1000 gms)
T.(M.T.)	-	Tonne (Equivalent to 1000 Kgs.)
No.	-	Numbers.
Cm.	-	Centimetre.
M or R.M.	-	Metre or Running Metre.

9.1 SUB DISTRIBUTION BOARDS & DISTRIBUTION BOARDS

9.1.1 GENERAL

SDB & Meter Boards shall be metal clad totally enclosed, rigid, floor mounting, air insulated, compartmentalized cubicle type Panel Board for use on 415 volts, three phases, 50Hz 4 wire system. Equipment shall be designed foroperation in high ambient temperature and high humidity tropical atmospheric conditions.

9.1.2 STANDARDS

The equipment shall be designed to conform to the requirements of :

9.1.2.1 IS 8623 / 93 - Factory Built Assemblies of switchgear and control gear.

9.1.2.2 IS 4237 - General requirements for switchgear and control gear for voltage not

exceeding 1000 volts.

9.1.2.3 IS 2147-Degrees of protection provided by enclosures for low voltage switchgear and control gear.

9.1.2.4 IS 375 - Marking and arrangement of busbars.

Individual equipment housed in the MDB / SDB & Meter Boards shall conform to the following IS specifications:

a) Moulded Case Circuit Breakers - IS : 13947-2/IEC 947-2.

b) Current Transformers - IS : 2705.

c) Indicating Instruments - IS : 1248.

d) Integrating Instruments - IS : 722.

e) HRC fuse links - IS : 13703 / IEC 269.

9.1.1 CONSTRUCTIONS

9.1.1.1 METER BOARD

Meter Board shall be metal clad totally enclosed, rigid, floor/wall mounting, air insulated, cubicle type for use on 415 volts, 3 phase, 50 cycle system and shall conform to IP-42 protection (indoor application). The Meter Board shall be fabricated with a 2mm CRCA sheet steel for load bearing members and 1.6mm for doors and partitions. Meter chamber dimension shall be as mention in BOQ item with separate cover and locking arrangement. All sheet steel work forming the exterior of meter board shall be smoothly finished leveled and free from flaws. The corner shall be rounded. Synthetic/Neoprene gasket shall be provided for each meter chamber. Main incoming MCCB and Busbars shall be in separate compartment. Cable alley shall be provided for housing wiring from Busbar chamber to individual meter chamber and for outgoing submain wiring originating from Meter chamber to each shop / office**.** Operating handle of the highest unit shall be at a height not more than 1700mm. Earth strip shall be fixed at bottom of Meter Board (Minimum size 20mm x 3mm GI) terminated at both end into terminal bolt. Overall height of Meter Board shall not exceed 2000mm.

9.1.1.2 SUB DISTRIBUTION BOARD

Sub Distribution Boards shall be constructed only of materials capable of withstanding the mechanical, electrical and thermal stresses, as the effects of humidity, which are likely to be encountered in normal service.

Each vertical section shall comprise of :

1. A front framed structure of rolled/folded sheet steel channel section, of minimum 2mm thickness, rigidly bolted together. This structure shall house the components contributing to the major weight of the equipment, such as circuit breaker cassettes, fuse switch units, main horizontal busbars, vertical risers and other front mounted accessories.
2. The structure shall be mounted on a rigid base frame of folded sheet steel of minimum 2mm thickness and 100 mm height or 100 mm x 50mm x 5mm thick MS Channel. The design shall ensure that the weight of the components is adequately supported without deformation or loss of alignment during transit or during operation.
3. A side cable chamber in Main / Sub Distribution Boards for housing the cable end connections, and power/ control cable terminations. The design shall ensure generous availability of space for ease of installation and maintenance of cabling, and adequate safety for working in one vertical section without coming into accidental contact with

live parts in an adjacent section.

4. A cover plate at the top of the vertical section, provided with a ventilating hood where necessary. Any aperture for ventilation shall be covered with a perforated sheet having less than 1 mm diameter perforations to prevent entry of vermin.
5. Front and rear doors fitted with dust excluding neoprene gaskets with fasteners designed to ensure proper compression of the gaskets. When covers are provided in place of doors, generous overlap shall be assured between sheet steel surfaces with closely spaced fasteners to preclude the entry of dust.
6. All doors shall be lockable mounted lock.
7. Gland plate shall be 3mm thick.

The height of the Main / Sub Distribution Boards / Meter Boards should not be more than 2000mm. The total depth of the panel should be adequate to cater to proper cabling space and should not be less than 400mm. Operating handle not higher than 1700mm and not lower than 300mm from bottom of MDB / SDB / Meter Board.

Doors and covers shall be of minimum 2mm thick sheet steel. Sheet steel shrouds and partitions shall be of minimum 2mm thickness. All sheet panels shall be smoothly finished, levelled and free from flaws. The corners should be rounded.

The apparatus and circuits in the panel board shall be so arranged as to facilitate their operation and maintenance and at the same time to ensure the necessary degree of safety.

Apparatus forming part of the Main / Sub Distribution Boards & Meter Boards shall have the following minimum clearances.

i. Between phases - 32mm.
ii. Between phases and neutral - 26mm.
iii. Between phases and earth - 26mm.
iv. Between neutral and earth - 26mm.

When, for any reason, the above clearances are not available, suitable insulation shall be provided. Clearances shall be maintained during normal service conditions.

Creepage distances shall comply to those specified in relevant standards.

All insulating material used in the construction of the equipment shall be of non-hygroscopic material, duly treated to withstand the effects of the high humidity, high temperature tropical ambient service conditions.

Functional units such as circuit breakers and fuse switches shall be arranged in multi-tier formation, except that not more than two air circuit breakers shall be housed in a single vertical section. Cable entry for various feeders shall be from the rear / front. Panel board shall be suitable for termination of cable for incoming breakers.

Metallic perforated barriers shall be provided within vertical sections and between adjacent sections to ensure prevention of accidental contact with:

i. Main busbars and vertical risers during operation, inspection or maintenance of functional units and front mounted accessories.
ii. Cable termination of one functional unit, when working on those of adjacent unit/units.

All doors/covers providing access to live power equipment/ circuits shall be provided with tool operated fasteners to prevent unauthorized access.

Provision shall also be made for permanently earthing the frames and other metal parts of the switchgear by two independent connections.

Main / Sub Distribution Board shall have full length of Earthing strip (minimum size

25mm x 3mm GI) at bottom of Panel for earth connection and brought out through terminal bolt at two end of Panel.

9.1.2 METAL TREATMENT AND FINISH

All metal work used in the construction of the MDB / SDB & Meter Boards should have under gone a rigorousmetal treatment process (7 tank) as follows**:**

1. Effective cleaning by hot alkaline degreasing solution followed by cold water rinsing to remove traces of alkaline solution.
2. Picking in dilute sulphuric acid to remove oxide scales & rust formation, if any, followed by cold water rinsing to remove traces of acidic solution.
3. A recognised phosphating process to facilitate durable coating of the paint on the metal surfaces and also to prevent the spread of rusting in the event of the paint film being mechanically damaged. This again, shall be followed by hot water rinsing to remove traces of phosphate solution.
4. Passivating in de-oxalite solution to retain and augment the effects of phosphating.
5. Drying with compressed air in a dust free atmosphere.
6. A finishing coat of powder coat painting having a paint thickness of 60 microns and the powder paint shall be subjected to over heated process.

9.1.3 BUSBARS

The busbars shall be air insulated and made of high conductivity, high strength Aluminium complying with the requirement of grade 63401 WP.

The busbars shall be suitably braced with non-hygroscopic SMC supports to provide a through fault withstand capacity of maximum 50KA RMS symmetrical for one second and a peak short circuit with stand capacity of 105 KA.

The neutral as well as the earth bar should be capable of with standing the above level. Ridges shall be provided on the SMC supports to prevent tracking between adjacent busbars. Large clearances and creepage distance shall be provided on the busbar system to minimize the possibility of fault. The main phase busbars shall have continues current rating throughout the length of the Panel. The cross section of neutral busbars shall be same as that of the phase busbar for busbars of capacity upto 200 Amp; for higher capacities, the neutral busbar shall not be less than half (50%) the cross section of that of the phase busbars. Minimum cross section size of busbars shall be as per Table IV of (CPWD General specification Electrical works Part-I Internal -2013). Connections from the main busbars to functional circuits shall be so arranged and supported to withstand without any damage or deformation the thermal and dynamic stresses due to short circuit currents. Busbars shall be colour coded with PVC heat shrinkable sleeves. All connectors of bus bars to busbars & outgoing termination arrangement is to be in Stainless steel non magnetic grade nut & bolts.

For Aluminium busbars, the busbar shall be of sufficient cross section so that current density of (One) Amp/Sq.mm is not exceeded at nominal current rating.

9.1.4 MOULDED CASE CIRCUIT BREAKERS

9.1.4.1 GENERAL

Moulded Case Circuit Breakers shall be incorporated wherever specified. MCCB's shall conform to IS 13947- 2 and/or IEC 947-2 in all respects. MCCB's shall be suitable either for single phase AC 230 volts or three phase 415 volts. MCCB shall be with thermo magnetic release type. All MCCB of 250Amp and above rating shall havemicroprocessor released.

9.1.4.2 CONSTRUCTIONS

The MCCB cover and case shall be made of high strength heat treatment and flame retardant thermo-settinginsulating material. Operating handle shall be of rotary type quick make/quick break, trip-free type. The operating handle for simultaneous operation and tripping of all the three phases.

Suitable fire arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermomagnetic type provided in each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. MCCB shall be line load reversible type. MCCB's shall be site adjustable thermal release (80% to 100%) of rated current. Device shall have IDMT characteristics for sustained overload and short circuits. MCCB shall be current limiting type MCCB shall be provided with rotary handle.

Contacts tips shall be made of suitable arc resistant, silver alloy for long electrical life. Terminals shall be of liberal design with adequate clearance.

9.1.4.3 RUPTURING CAPACITY

The Moulded Case Circuit Breaker shall have a minimum fault breaking capacity (Ics) of not less than 25 KA RMS at 415 volts for MDB / SDB & Meter Boards and / or higher capacity as specified in individual panel item.

9.1.4.4 TESTING

Test certificate of the MCCB as per relevant Indian Standards (IS) shall be furnished.

9.1.5 MINIATURE CIRCUIT BREAKER

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system. The MCB's shall have a rupturing capacity of 10 KA. The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection.

9.1.6 MEASURING INSTRUMENTS, FOR METERING

GENERAL

Direct reading electrical instruments shall be in conformity with IS 1248. The accuracy of direct reading shall be 1.0 for voltmeter and 1.0 for ammeters. Other type of instruments shall have accuracy of 1.0. The errors due to variations in temperature shall be limited to a minimum. The meter shall be suitable for continuous operation between-10 degree Centigrade to + 50 degree Centigrade. All meters shall be of flush mounting type of 96mm square or circular pattern. The meter shall be enclosed in a dust tight housing. The housing shall be of steel or phenolic mould. The design and manufacture of the meters shall ensure the prevention of fogging of instruments glass. Instruments meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible without removal of the seal. The meters shall be provided with white dials and black scale markings.

The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside. The direction of deflection shall be from left to right.

Suitable selector switches shall be provided for all ammeters and voltmeters intended to be used on three phase supply.

The specifications herein after laid down shall also cover all the meters, instrument and protective devices required for the electrical work. The ratings type and quantity

of meters, instruments and protective devices shall be as per the schedule of quantities.

9.1.6.1 DIGITAL AMMETERS

Ammeters shall be digital type 7 segment LED display. Ammeter shall be suitable for accuracy class 1.0 and burden 0.5 VA approx. The ammeters shall be capable of carrying sustained overloads during fault conditions without damage or loss of accuracy.

9.1.6.2 DIGITAL VOLTMETERS

Voltmeter shall be digital type 7 segment LED display. Voltmeter shall be suitable for accuracy class 1.0 and burden 0.5 VA approx. The range for 3 phase voltmeters shall be 0 to 500 volts. The voltmeter shall be provided with protection fuse of suitable capacity.

9.1.6.3 CURRENT TRANSFORMERS

Current transformers shall be in conformity with IS: 2705 (Part I, II & III) in all respects. All current transformers used for medium voltage applications shall be rated for 1kv. Current transformers shall have rated primary current, rated burden and class of accuracy as required. However, the rated secondary current shall be 5A unless otherwise specified. The acceptable minimum class of various applications shall be as given below:

Measuring : Class 1.

Protection : Class 5P10.

Current transformers shall be capable of withstanding without damage, magnetic and thermal stresses due to short circuit fault of 50KA on medium voltage system. Terminals of the current transformers shall be marked permanently for easy identification of poles. Separate CT shall be provided for measuring instruments and protection relays. Each C.T. shall be provided with rating plate.

Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CT's shall be copper conductor, PVC insulated wires with proper termination lugs and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

9.1.7 MISCELLANEOUS

Control switches shall be of the heavy-duty rotary type with escutcheon plates clearly marked to show the operating position. They shall be semi-flush mounting with only the front plate and operating handle projecting.

Indicating lamps shall be of the LED type, and with translucent lamps covers. Bulbs & lenses shall be easily replaced from the front.

Push buttons shall be on the momentary contact, push to actuate type fitted with self-reset contacts & provided with integral escutcheon plates marked with its functions.

9.1.8 CABLE TERMINATIONS

Cable entries and terminals shall be provided in the sub distribution boards to suit the number, type and size of aluminium conductor power cable and copper conductor control cable specified.

Provision shall be made for top or bottom entry of cables as required. Generous size of cabling chambers shall be provided, with the position of cable gland and terminals such that cables can be easily and safely terminated. Cable glands shall be double compression type, barriers or shrouds shall be provided to permit safe working at the terminals of one circuit without accidentally touching that of another live circuit.

Cable risers shall be adequately supported to withstand the effects of rated short circuit currents without damage and without causing secondary faults.

9.1.9 CONTROL WIRING

All control wirings shall be carried out with 1100/660V grade single core PVC cable conforming to IS 694/ IS 8130 having stranded copper conductors of minimum 1.5 sq.mm for potential circuits and 2.5 sq.mm for current transformer circuits. Wiring shall be neatly bunched, adequately supported and properly routed to allow for easy access and maintenance. Wiring shall be identified by numbering ferrules at each end. All control fuses shall be mounted in front of the panel and shall be easily accessible.

9.1.10 TERMINAL BLOCKS

Terminal blocks shall be 500 Volts grade of the stud type. Insulating barriers shall be provided between adjacent terminals. Terminals block shall have a minimum current rating of 10 Amps and shall be shoruded.Provisions shall be made for label inscriptions.

9.1.11 LABELS

Labels shall be of anodized aluminium, with white engraving on block background. They shall be properlysecured with fasteners.

9.1.12 TEST AT MANUFACTURES WORK

All routine tests specified is IS : 8623-1977 shall be carried out and test certificates submitted to the Engineer-in-Charge.

9.1.13 TESTING AND COMMISSIONING

Commissioning checks and tests shall be included all wiring checks and checking up of connections. Primary/secondary injection tests for the relays adjustment/ setting shall be done before commissioning in addition to routine meggar test. Checks and tests shall include the following.

9.1.13.1 Operation checks and lubrication of all moving parts.

9.1.13.2 Interlocking function check.

9.1.13.3 Insulation test : When measured with 500V meggar, the insulation resistance shall not be less than 100 mega ohms.

9.1.13.4 Trip tests & protection gear test.

Type test certificates from independent authorities shall be furnished.

9.2 DISTRIBUTION BOARDS.

Distribution boards for final distribution for lighting & small power shall be provided under Internal Electrical Works. DB's shall be prewired type (Three phase or Single phase).

Distribution Board shall be double door type with extended loose wire box at the top and suitable for flush installation. All distribution boards shall be of three phase (415 Volts) or single-phase (240Volts) type with incoming isolator or MCB and/or ELCB as in bill of quantities. Distribution boards shall contain plug in or bolted type miniature circuit breaker mounted on busbars. Miniature circuit breakers shall be quick make & quick break type with trip free mechanism. MCB shall have thermal & magnetic short circuit protection. MCB shall conform with IS 8828-1978. Busbars shall be of electrolytic copper. Neutral busbars shall be provided with the same number of terminals, as there are single ways on the board, in addition to the terminals for incoming mains. An earth bar of similar size as the neutral bar shall also be provided. Phase barrier shall be fitted and all live parts shall be screened from the front. Ample clearance shall be provided between all live metal and the earth case and adequate space for all incoming and outgoing cables. All distribution board enclosures shall have an etched zinc base stove painted followed by synthetic

stoved enamel, colour light gray. A circuit identification card in clear plastic cover shall be provided for each distribution board.

Distribution Board with single-phase outgoings requirement shall be Horizontal type. Distribution Board with three-phase outgoings requirement shall be Vertical/ Horizontal type. Distribution Board installed in indoor dry locations shall conform to IP-42.Distribution Board installed in outdoor & wet locations shall conform to IP- 65.

Miniature Circuit Breakers for lighting circuits shall be of "C" series. All miniature circuit breakers shall be of not less than 10 KA rated rupturing capacity.

Distribution Board shall be provided with isolator or MCB and/or Residual Current Circuit Breaker as mentioned in drawings and BOQ. Residual Current Circuit Breaker shall be current operated type and of minimum 30mA sensitivity unless otherwise stated. RCCB shall be mounted within distribution board box for single phase distribution board while in three phase distribution board RCCB shall be either mounted within distribution board box or in a separate MS box below distribution board. Width and depth of RCCB box shall be same as that of distribution board box and of same finish. Height of RCCB box shall be sufficient to accomodate RCCB & termination of incoming & outgoing wires. Distribution board box, isolator, MCB'S used shall be of one/same manufacturer. Standard size manufactured by approved manufacturer shall be used. In case size specified in BOQ is not standard size of manufacturer, in that case next standard size distribution board box shall be used with incoming & outgoing MCB as specified in BOQ. Additional cutout/space for outgoing MCB shall be plugged with blank plates. No extra cost shall be paid for using bigger/higher size distribution board box and blank plates.

9.3 CONDUIT AND WIRING SYSTEM

9.3.1 General

Conduit & wiring of light points, fan points, light plug points, power points (general & for equipment wiring), indoor AC unit / FCU 6A light plug points & shall be in general shall be carried out in concealed / recess / surface system with PVC conduit & accessories.

Conduiting of telephone, data networking & CCTV, access control points conduiting shall be carried out in with PVC conduit & accessories and shall in general carried out in concealed/ recess/ surface conduit system. Fish wire shall be provided in all conduits provided for telephone & data networking to facilitate drawing of wires.

Wiring for FDA system shall be carried out with Fire Survival cables.

Conduiting for submain wiring shall be carried out in PVC conduit with junction boxes to facilitate drawing of submain wiring.

Conduiting works may be carried out on surface . Conduits shall be fixed directly to soffit of slab / wall and / or fixed on purposed made suspender/ supports as per the direction of Engineer – in – charge. Cost of purpose made suspenders / supports, saddles etc. shall deemed to be included in the quoted rates of the point wiring / conduiting items.

All conduiting works in walls shall be carried out in recessed / concealed in wall.

Wiring of light circuit (namely light point, fan point & light plug point) shall be in separate conduit than wiring for power points.

Separate conduiting shall be provided for lighting point, power points, telephone points, CCTV point, Data Networking, access control etc. wiring for normal & UPS supply shall be in separate conduit etc. Low voltage conduits shall in general kept way at least 300mm for electrical wiring conduits.

9.3.2 PVC CONDUIT

Conduits shall be heavy gauge rigid PVC of minimum thickness of 2mm. Conduits shall be ISI marked confirming to IS : 9537 (Part-3)-1983. All conduit and conduit accessories shall be of PVC. Conduits shall be joined togetherby vinyle type cement /

solvents. Minimum size of conduit shall be 25mm dia. Conduit shall be fixed on ceiling orwall. All conduits shall be concealed in wall ceiling etc. or fixed on surface of wall with clamps at regular interval as called for elsewhere. For termination of PVC conduits into switch outlet boxes, PVC female adopters shall beused. Wherever conduit run exceeds 10 metre, circular junction boxes shall be provided to facilitate pulling & inspection of wires. Inspection boxes shall be suitable located in co-ordination with the Engineer-in-charge. Conduits shall be bend using suitable size springs. Long radius bends shall be provided. Heating shall not be used to bend the conduits. Size of conduit shall depend upon number and size of wires to be drawn.

9.3.3 FIXING OF CONDUITS

9.3.3.1 SURFACE CONDUIT

Conduit pipes shall be fixed by heavy gauge saddles, secured to suitable rawl plugs or other approved plugs with screws in an approved manner at an interval of not more than one metre but on either side of the couplers or bends or similar fittings, saddles shall be fixed at a distance of 30cm from the centre of such fittings. The saddles should not be less than 24 gauges for conduits upto 25mm dia and not less than 20 gauge for larger diameter conduits. The corresponding widths shall be 19mm & 25mm. Where conduit pipes are to be laid along the trusses, steel joint etc. the same shall be secured by means of special clamps made of MS. Where as it is not possible to drill holes in the trusses members suitable clamps with bolts and nuts shall be used. All fixing arrangement like saddles, special purpose clamps, nuts, bolts etc. shall deemed to be included in quoted rates of conduit. Conduits above false ceiling shall be fixed on purposed made suspension / supporting arrangement and duly saddled to supports and cost of the suspenders / supports deemed to be included in the quoted rates.

For 25mm diameter conduit width of clip shall be 19mm and of 20 SWG. For conduit of 32mm and above, width of clip shall be 25mm and of 18 SWG.

Where conduit pipes are to be laid above false ceiling, conduit pipes shall not be clamp to false ceiling framework. Conduits shall be either fixed to soffit of slab / wall or suspended with suitable supports from the soffit of slab. For conduit pipe run along with wall, the conduit pipe shall be clamped to wall above false ceiling in uniform pattern with special clamps if required to be approved by the Engineer-In-Charge at site.

9.3.3.2 RECESS / CONCEALED CONDUIT

The chase in the wall shall be neatly made and of ample dimensions to permit the conduit to be fixed in the manner desired. In the case of building under construction, conduit shall be buried in the wall before plastering and shall be finished neatly after erection of conduit. Incase of exposed brick/rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work. Entire work of chasing the wall, fixing the conduit in chases, and during the conduit in mortar before plastering shall form part of point wiring work. (For chase cutting-chase cutting machine shall be used and no manual cutting shall be allowed).

The conduit pipe shall be fixed by means of stapples or by means of saddles not more than 60cm apart or by any other approved means of fixing. Fixing of standard bends and elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe itself with the long radius, which shall permit easy drawing in of conductors. All threaded joint of conduit pipe shall treated with some approved preservative compound to secure protection against rust. Suitable inspection boxes to the barest minimum requirements shall be provided to permit periodical inspection and to facilitate replacement

of wires, if necessary. These shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection box covers. Wherever the length of conduit run is more than 10 metres, then circular junction box shall be provided to facilitate pulling of wires.

9.3.3.3 CONDUITING FLOOR

Conduiting works in general shall not be carried in flooring (floor finish). However in case conduiting works is carried in floor, then conduit shall be of mild steel. Conduits shall be fixed on top of RCC slab prior for floor finishing.

9.3.4 ERECTION AND EARTHING OF CONDUIT

The conduit of each circuit or section shall be completed before conductors are drawn in. The entire system of conduit after erection shall be tested for mechanical and electrical continuity throughout and permanently connected to earth conforming to the requirement by means of special approved type of earthing clamp effectively fastened to conduit pipe in a workmen like manner for a perfect continuity between the earth and conduit. Gas, water pipe shall not be used as earth medium.

9.3.5 LIGHT & POWER ACCESSORIES

9.3.5.1 GENERAL

All light & power accessories shall be of modular range of plate switch type and shall be of one manufacturer (brand) and type. Boxes for switch & outlet (light & power accessories) shall be of specific manufacture standard design.

9.3.5.1 20 AMP SPN SOCKET OUTLET

Switch socket outlet on power/AC circuit shall be of 6 pin 20 Amp outlet (Universal Socket) shall have safety shutters. The switch shall be of rocker mechanism type with silver contacts. Socket outlet shall be shutter type and of modular range of plate type and having white finish. Switch and socket outlet shall be mounted on a suitable size G.I. box with suitable size modular cover plate.

9.3.6 WIRING

All PVC insulated copper conductor multi-stranded wires **(FRLS Type)** shall conform to relevant IS Codes. Cable conductor size and material shall be as specified in BOQ**.**

All internal wiring shall be carried out with PVC insulated wires of 650/1100 volts grade. The circuit wiring for points shall be carried out in looping in system and no joint shall be allowed in the length of the conductors. Circuit wiring shall be laid in separate conduit originating from distribution board to switch board for light/fan. A light/fan switchboard may have more than one circuit but shall have to be of same phase. Looping circuit wiring shall be drawn in same conduit as for point wiring. Each circuit shall have a separate neutral wire. Neutral looping shall be carried out from point to point or in light/fan switchboards. A separate PVC insulated copper conductor earthwire shall be provided alongwith circuit wiring for each circuit. For point wiring red colour wire shall be used for phase and black colour wire for neutral. Circuit wiring shall be carried out with red, yellow or blue colour PVC insulated wire for RYB phase wire respectively and black colour PVC insulated wire for the neutral wires. copper wire shall be used as earth continuity conductor and shall be drawn alongwith other wires. No wire shall be drawn into any conduit until all work of any nature, that may cause injury to wire is completed. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire.

Before the wires are drawn into the conduit, the conduits shall be throughly cleaned of moisture, dust and dirt. Drawing & jointing of copper conductor wires & cables shall be as per CPWD specifications.

9.3.7 JOINTS

All joints shall be made at main switches, distribution board socket and switch boxes only. No joint shall be made in conduits & junction boxes. Conductors shall be continuous from outlet to outlet.

9.3.8 SUB MAINS

Submain wiring shall be carried out with PVC Insulated Copper conductor multi-stranded wires/cables (FRLS Type) in suitable PVC conduit for final distribution board.

Sub-main cable where called for shall be of the rated capacity and approved make. Every sub-main shall be drawn into an independent adequate size conduit. Adequate size draw boxes shall be provided at convenient locations to facilitate easy drawings of the sub-main cables. Cost of junction box/drawn box is deemed to be included in the rates of submain wiring. An independent earth wire of proper rating shall be provided for every sub-main. Single phase submain shall have single earth wire whereas three phase submain shall be provided with two earth wire. Earth wire for sub-main wiring shall also be PVC insulated copper conductor for suitable size / capacity and shall be draw alongwith phase & neutral wired in the same conduit

Where sub-mains cables are connected to the switchgear, sufficient extra lengths of submain and mains cable shall be provided to facilitate easy connections and maintenance. For termination of cables criping type cable socket/lugs shall be provided. Same colour code as for circuit wiring shall be followed.

9.3.9 LOAD BALANCING

Balancing of circuits in three phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

9.3.10 COLOUR CODE FOR CIRCUIT & SUBMAIN WIRING

Colour code for circuit & submain wiring installation shall be Red, Yellow, Blue for three phases. Black for neutral and yellow/ green or green only for earth incase of insulated earth wire.

Maximum number of PVC insulated 650/1100 V grade aluminium/copper conductor cable conforming to IS : 694 – 1990, that can be drawn into rigid PVC/MS conduit

Nominal Cross-Sectional Area of conductor In Sq.mm	20mm		25mm		32mm		38mm		51mm		64mm	
	S	B	S	B	S	B	S	B	S	B	S	B
4	3	2	6	5	10	8	-	-	-	-	-	-
6	2	-	5	4	8	7	-	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-		-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25	-	-	-	-	3	2	5	3	8	6	9	7
35	-	-	-	-	-	-	3	2	6	5	8	6
50	-	-	-	-	-	-	-	-	5	3	6	5
70	-	-	-	-	-	-	-	-	4	3	5	4

NOTE :

1. The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.

2. The columns headed ‘S' apply to runs of conduits which have distance not exceeding 4.25m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed `B' apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.

3. Conduit sizes are the nominal external diameters.

9.4 L.T CABLES

9.4.1 GENERAL

L.T. Cables shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant Indian Standards specifications and cable manufacturer’s instructions. The cable shall be delivered at site in original drums with manufacturer’s name clearly written on the drums. The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

9.4.2 MATERIALS

The L.T. Power cables shall be XLPE insulated PVC sheathed type aluminium conductor armoured cable conforming to IS : 7098 : 1988 (Part-I) with upto date ammendments where as control cable shall be XLPE insulated and PVC sheathed copper conductor armoured/ unarmoured cable conforming to IS:7098 (Part-I) 1988.

9.4.3 INSTALLATION OF CABLES

Cables shall be laid directly in ground, pipes, masonry ducts, on cable tray, surface of wall/ceiling etc. as indicated on drawings and/or as per the direction of Engineer-In-Charge. Cable laying shall be carried out as per CPWD specifications.

9.4.4 INSPECTION

All cables shall be inspected at site and checked for any damage during transit.

9.4.5 JOINTS IN CABLES

The Contractor shall take care to see that the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoiding of cable joints. This apportioning shall be got approved from Engineer-In-Charge before the cables are cut to lengths.

9.4.6 LAYING CABLES IN GROUND

Cables shall be laid by skilled experienced workmen using adequate rollers to minimize stretching of the cables. The cable drums shall be placed on jacks before unwinding the cable. With great care it shall be unrolled on over wooden rollers placed in trenches at intervals not exceeding 2 metres. Cables shall be laid at depth of 0.75 metres below ground level. A cushion of sand total of 250mm shall be provided both above and below the cable, joint boxes and other accessories**.** Cable shall not be laid in the same trench or along side a water main**.**

The cable shall be laid in excavated trench over 80mm layer of sand cushion. The relative position of the cables, laid in the same trench shall preserved. At all changes in direction in horizontal and vertical planes, the cables shall be bent smooth with a radius of bent not less than 12 times the diameter of cables. Minimum 3 metre long loop shall be provided at both end of cable.

Distinguishing marks may be made on the cable ends for identifications of phases**.** Insulation tapes of appropriate voltage and in red, yellow and blue colours shall be wrapped just below the sockets for phase identifications.

9.4.7 PROTECTION OF CABLES

The cables shall be protected by bricks laid on the top layer of the sand for the full length of underground cable. Where more than one cables is laid in the same trench, the bricks shall cover all the cables and shall project a minimum of

approximately 80mm on either side of the cables. Cable under road crossings and any other places subject to heavy traffic, shall be protected by running them through Hume Pipes of suitable size.

9.4.8 EXCAVATION & BACK FILL

All excavation and back fill required for the installation of the cables shall be carried out by the Contractor in accordance with the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Back fill for trenches shall be filled in layer not exceeding 150mm. Each layer shall be properly rammed and consolidated before laying the next layer.

The Contractor shall restore all surface, roadways, side walks, kerbs wall or the works cut by excavation to their original condition to the satisfaction of the Engineer-In-Charge.

9.4.9 LAYING OF CABLES ON CABLE TRAY/SURFACE OF WALL/CEILING

Cable shall be laid on perforated M.S. Cable tray. Cables shall be properly dressed before cable ties/clamps are fixed. Wherever cable tray is not proposed, cables shall be fixed on surface of wall or ceiling slab by suitable MS clamps/ saddles**.** Care shall be taken to avoid crossing of cable.

9.4.10 CABLES ON HANGERS OR RACKS

The Contractor shall provide and install all iron hangers racks or racks with die cast cleats with all fixings, rag bolts or girder clamps or other specialist fixing as required.

Where hangers or racks are to be fixed to wall sides, ceiling and other concrete structures, the Contractor shallbe responsible for cutting away, fixing and grouting in rag bolts and making good.

The hangers or racks shall be designed to leave at least 25mm clearance between the cables and the face to which it is fixed. Multiple hangers shall have two or more fixing holes. All cables shall be saddled at not more than 150mm centres. These shall be designed to keep provision of some spare capacity for future development.

9.4.11 CABLES TAGS

Cable tags shall be made out of 2mm thick aluminium sheets, each tag 1-1/2 inch in dia with one hole of 2.5mm dia, 6mm below the periphery. Cable designations are to be punched with letter/number punches and the tags are to be tied inside the panels beyond the glanding as well as below the glands at cable entries. Trays tags are to be tied at all bends. On straight lengths, tags shall be provided at every 5 metres.

9.4.12 TESTING OF CABLES

Prior to installation, burying of cables, following tests shall be carried out. Insulation test between phases, phase & neutral, phase & earth for each length of cable.

1. Before laying.
2. After laying.
3. After jointing.

On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer-In- Charge.

a. Insulation Resistance Test (Sectional and overall).
b. Continuity Resistance Test.
c. Earth Test.

All tests shall be carried out in accordance with relevant Indian Standard code of practice and Indian Electricity Rules**.** The Contractor shall provide necessary instruments, equipments and labour for conducting the above tests & shall bear all expenses of conducting such tests.

9.5 PERFORATED TYPE CABLE TRAY

The cable tray shall be fabricated out of slotted/perforated MS sheets as channel sections, single or double bended**.** The channel sections shall be supplied in convenient lengths and assembled at site to the desired lengths**.** These may be galvanised or painted as specified**.**

Typically, the dimensions, fabrication details etc. are shown in CPWD General Specification for Electrical Works Part-II-External: 1994**.**

The jointing between the sections shall be made with coupler plates of the same material and thickness as the channel section. Two coupler plates, each of minimum 200mm length, shall be bolted on each of the two sides of the channel section with 8mm dia round headed bolts, nuts and washers**.** In order to maintain proper earth continuity bond, the paint on the contact surface between the coupler plates and cable tray shall be scraped and removed before the installation**.**

The maximum permissible uniformly distributed load for various sizes of cable trays and for different supported span are as per Table-IV of CPWD General Specifications of Electrical Works Part II(External) : 1994 **.** The sizes shall be specified considering the same**.**

Factory fabricated bends, reducers, tee/cross junctions, etc. shall be provided as per good engineering practice**.** (Details are typically shown in figure-3) of CPWD General Specifications of Electrical Work Part-II – 1994**.** The radius of bends, junctions etc. shall not be less than the minimum permissible radius of bending of the largest size of cable to be carried by the cable tray**.**

The entire tray (except in the case of galvanised type) and the suspenders shall be painted with two coats of red oxide primer paint after removing the dirt and rust, and finished with two coats of spray paint of approved make synthetic enamel paint**.**

SECTION 10
SYNCHRONIZATION

10.1 SCOPE

This section covers synchronization of DG sets as required (to be decided by NIT approving authority) and comprises of running of DG set in parallel i.e., their synchronization on common bus bar, auto load sharing and auto load management.

10.2 PLC PANEL

Operation of DG sets shall be monitored and controlled by PLC panel i.e., Programmable logic controller-based logic panel. In case of mains failure, this logic panel shall control auto changeover from mains to DG Sets supply and interlocking of ACBs, auto synchronizing and auto Load management functions along with annunciation for alternator control and protection.

The logic Panel shall be provided with a total manual override facility. There shall be Smooth transfer of DG set operation from PLC to manual system & vice versa without any interruption/tripping. The logic panel shall be complete with all Auxiliary Relays. Timers, Contactors, Programmable logic controller, control wiring, interconnections etc. with 2.5 sq.mm. PVC insulated, 1.1 KV grade copper conductor wires.

10.3 CONTROL PHILOSOPHY

10.3.1 Automatic Start & Stop of Engine:

The system should come in operation after sensing of grid failure and automatically control the start & stop of engines, depending on the predefined load setting in the PLC. In case engine does not start in the first cranking, two more auto commands should be given with proper intervals. Even then if engine fails to start, indication must appear on MMI (Man Machine interface). In the event the engines are under loaded i.e., load sensed is capable of being catered by less than the capacity of running DG sets then command must be given to stop required number of excess DG sets after running idle for short duration. Provision to select no. of DG sets to be started and synchronised at no load to cope up with sudden load without tripping the DG's should also be inbuilt into the system.

10.3.2 Automatic Synchronisation:

The facility of synchronisation will be available in both Auto & Manual mode. In normal circumstances the auto synchronisation will work, however if due to any reason auto synchronisation fails repeatedly, the facility for Closer of ACB must be available automatically. In manual mode ACB will be closed by panel push button.

10.3.3 Automatic Load Sharing:

The load sharing will also be automatic, by sensing both active & reactive power.

10.3.4 Back up Protection:

The system should also have following inbuilt protection other than external relays in synchronization panel:

Reverse power, Reverse KVAR, Over Current, Under voltage, Over voltage, Under frequency, Over frequency, synchro-check & earth fault relay except differential relay. Due to any electrical fault PLC shall trigger the master trip relay.

These PLCs will be state of the art equipments using latest technology and of most rugged and reliable design. Since they shall be operating in the harsh & unfriendly environment of DG room, they will be suitable to operate trouble free in those conditions. The chosen equipment should be able to withstand high temperature, humidity & voltage fluctuations, thus making it suitable for the operating conditions described above.

10.3.5 Sequence of operation

The following sequence of operation shall be achieved through PLC based logic panel in addition to hardware interlocks as well as software interlocks:

1. Selection of any generator as a lead generator to achieve the uniform running hours of all generators.
2. Three attempts to start the engine of lead generator. In case the engine fails to start or does not achieve the requisite speed within the predetermined time, PLC system declares engine of generator faulty. In this event PLC automatically selects next generator as the lead generator.
3. The PLC system automatically selects starting sequence of other generators based on the lead generator being selected by the operator. Before issuing close command to lead generator air circuit breaker, PLC checks that ACB of any other generator is not in close position. Then PLC system gives close command to lead generator ACB. The PLC system tries two times with interval of 5 secs. to close the ACB. Simultaneously, it also gives starting command to next generator engine in queue depending upon load.
4. The speed, excitation, frequency, and voltage of incoming generator is controlled identically as per the lead generator starting sequence described above, except closing of ACB.
5. When the lead generator KW crosses more than the 85% of rated capacity of DG set, the PLC system performs synchronization sequence for paralleling of generator prior to switching on of the ACB of 2nd generator. When the KW of 2nd generator crosses 80% of rated capacity of DG set then the PLC system performs synchronization sequence for paralleling of next generator prior to switching on the ACB of 3rd generator and similar sequence to be followed for other DG sets.
6. The last incoming generator ACB is tripped when PLC system senses that the total load on the system is less than the specified load and stops the engine after 5 minutes of idle running.
7. DG sets will start and stop automatically depending on the pre-defined load setting in the PLC & also all DG sets will operate in load sharing mode.

SECTION 11
SAFETY REQUIREMENTS

11.1 SCORE:

This section covers the requirements of items to be provided in the sub-station for compliance with statutory regulations. Safety and operational needs.

11.2 REQUIREMENTS:

Safety provisions shall be generally in conformity with appendices (A) and (C) of CPWD General Specifications of Electric Works (Par I Internal) 2013. Following items shall be provided:

(a) Insulation mats:

Insulation mats conforming to IS: 15652-2006 shall be provided in front of main switch boards as well as other control equipments as specified.

(b) First Aid Charts and First Aid Box:

Charts (one in English, one in Hindi, one in Regional language), displaying methods of giving artificial respiration to a recipient of electrical shock shall be prominently provided at appropriate place. Standard first aid boxes containing materials as prescribed by St. John Ambulance brigade or Indian Red Cross should be provided in each sub-station.

(c) Danger Plate:

Danger Plates shall be provided on HV and MV equipments. MV danger notice plate shall be 200 mm x 150 mm made of mild steel at least 2mm thick vitreous enameled white on both sides and with the descriptions in signal red colour on front side as required. Notice plates of other suitable materials such as stainless steel, brass or such other permanent nature material shall also be accepted with the description engraved is signal red colour.

(d) Fire Extinguishers:

Portable Co2 conforming to IS: 2878-2004/ chemical conforming to IS: 2171- 1999 extinguishers, HCFC Blend A (P-IV) shall be installed in the sub-station at suitable places. Other extinguishers recommended for electric fires may also be used.

(e) Fire Buckets:

Fire buckets conforming to IS: 2546-1974 shall be installed with the suitable stand for storage of water and sand.

(f) Toolbox:

A Standard toolbox containing necessary tools required for operation and maintenance shall be provided in the sub-station.

(g) Caution Board:

Necessary number of caution boards such as “Man online” ‘Don’t Switch on’ etc. shall be available in the sub-station

(h) Keyboard:

A keyboard of required size shall be provided at a proper place containing castle keys, and all other keys of sub-station and allied areas.

SECTION 12
LIST OF INDIAN STANDARDS

I	ELECTRO –TECHNICAL VOCABULARY	
Sl No	Definition	IS Code
1	Fundamental definition	IS: 1885 (Part-I) 1961
2	Secondary cells and batteries (Superceding IS: 1147-1957)	IS: 1885 (Part-VIII) 1986
3	Electrical power system protection	IS: 1885 (Part-X) 1993
4	Electrical Measurement	IS: 1885 (Part-XI) 1966
5	Switchgear and control gear (First revision)	IS: 1885 (Part-XVII) 1979
6	Overhead transmission and distribution of electrical energy	IS: 1885 (Part-XXX) 1971
7	Electrical supply (Superseding IS : 1591-1960)	IS: 1885 (Part-XXXII) 1993
8	Transformers (First revision)	IS: 1885 (Part-XXXVIII) 1993
II	GRAPHICAL SYMBOLS USED IN ELECTRO TECHNOLOGY	
1	Guide for preparation of diagrams, charts & tables for electro technology. Definitions and classification (Superseding IS: 2032 (Part-I) 1962	IS: 8270 (Part-I) 1976
2	Item designation	IS: 8270 (Part-II) 1976
3	General requirements for diagrams	IS: 8270 (Part-III) 1977
4	Circuit diagrams	IS: 8270 (Part-IV) 1977
5	Inter connection diagrams and table	IS: 8270 (Part-V) 1976
III	CONDUCTOR AND POWER CABLES	
1	PVC insulated cable for working voltages up to and including 1100 volts (Second revision) (Superseding IS: 3035 Part I 1965)	IS: 694/1990
2	PVC insulate (Heavy duty) working dielectric cables for voltage up to & i/c. 1100 volts (Second revision)	IS:1554 (Part-I)/ 1988
3	For working voltage from 3.3 KV up to and including 11KV	IS: 1554 (Part II)/1988
4	Recommended current ratings for cables	IS:3961 (Part I) 1967
5	Paper insulated lead sheathed cables PVC insulated and PVC sheathed heavy	IS: 3961 (Part II) 1967
6	Application guide for nonlinear resistor type Surge arrester for alternating current system (First revision)	IS: 15086 (Part-5)
7	Recommended short circuit ratings of high voltage PVC cable	IS: 5819-1970
8	Conductors for insulated electric cables and flexible cords.	IS: 8130/1984
9	Busbar trunking system (Air insulated & sand witch insulated type)	IS: 8623 Part I & II/ 1993, IEC 60439-Part I & II

IV	ELECTRICAL INSTALLATION CODE OF PRACTICES	
1	Installation and maintenance of transformers	IS: 10028 (Part-II & III)
2	Insulation oil in service, maintenance, and supervision code of practice for	IS: 1866/2000
3	Guide for short circuit calculations	IS: 13234
4	Electrical wiring installation (system voltage not exceeding 650 volts)	IS: 732/1989
5	Paper insulated power cables (Upto and including 33KV (first revision)	IS: 1255/1983
6	Earthing	IS : 3043/1987
V	SWITHC GEAR AND CONTROL GEAR	
1	Degree of protection provided by (enclosure for low voltage switchgear and control gear)	IS: 13947 (Part-I)
2	HRC cartridge fuse links upto 650 volts	IS: 9224 (Part-II)
3	Circuit breaker AC requirements & tests IS:13947 (Part -II) for voltages not exceeding 1000 Volts a.c or 1200 volts d.c.	IS:13947 (Part -II)
4	General and definition. Section 2- IS: 13118-1991 Voltages above 1000 volt a.c.	IS: 13118-1991
5	Type tests & Routine test for voltage IS: 13118-1991 above 1000 Volt a.c.	IS: 13118-1991
6	Heavy duty air break switches and composite units of air break switches & fuses for voltages not exceeding 1000 volts.	IS: 4064
7	General requirements for switch gear, control gear for voltage not exceeding 1000 volts	IS: 13947 (Part-I)
8	Factory built assemblies of switch gear and control gear for voltages upto & including 1000 V AC or 1200 V DC	IS 8623:1993
9	Requirements for bus bar trunking system (Bus ways)	IS: 8623 (Part II)/1993
10	High Voltage alternating current circuit breaker	IS: 13118-1991, IEC : 60056
11	High Voltage Switches –Part I : Switches for Rated Voltages Above I Kv and Less Than 52Kv	IS: 9920-2002
12	A.C Metal Enclosed Switchgear and Control gear for Rated Voltages Above I Kv and UP to and Including 52 Kv	IS : 3427-1997
13	Electrical Measuring Instruments and their Accessories	IS: 1248
VI	TRANSFORMERS ANDF REACTORS	
1	Oil type power transformer	IS: 11171-1985
2	Power transformer General	IS:2026 (Part-I) -1977
3	Power transformer Temperature rise	IS: 2026 (Part-II)-1977
4	Power transformer Insulation level and di-electric tests	IS: 2026 (Part-III)/1981
5	Distribution transformers	IS: 1180/1989
6	Gas operated relays	IS: 3637/1966
7	Power transformers fittings and accessories	IS: 3639/1966
8	Guide for loading of oil immersed transformers	IS: 6600/1972
9	Current transformers Part I to III	IS: 2705/1992
10	Voltage transformers Part I to III	IS: 3156/1992
11	Outdoor type three- phase distribution transformers	IS: 2099/1986

VII	CHEMICALS:	
1	Colours for ready mixed paints and enamels	IS: 5/1994 (Third revision)
2	Ready mixed paint brushing zinc chrome priming (IInd revision)	IS: 104/1979
3	Enamel, synthetic exterior (a) under coating (b) finishing (Ist revision)	IS: 2932/2003
VIII	INSULATING LIQUIDS	
1	Specific resistance (resistivity) or electrical insulating liquids, methods of tests for	IS: 6103/1971
2	Electric strength of insulating oils, methods for determination of	IS: 6792/1992
3	New insulation oils for transformers and switchgears (2nd revision)	IS: 335/1993
IX	SAFETY EQUIPMENTS	
1	CO2 based Fire Extinguisher	IS: 2878/1976
2	Chemical based Fire Extinguishers	IS: 2171/1976
3	HCFC Blend- A Extinguishing System	IS: 15505-2004
4	Insulating Mats	IS: 15625-2006

LIST OF APPROVED MAKES SECTION 13

S. N	ITEMS	Approved Make
1	LT PANELS	OEM Design verified LV Panel Manufactured by OEM Authorized License Partner as per IEC 61439-1&2 and Inspection at OEM Authorized License Partner's premises.
2	AIR CIRCUIT BREAKERS	SCHNEIDER/ L&T/ SIEMENS/ ABB/ LEGRAND
3	MCCB/MCB	SCHNEIDER/ L&T/ SIEMENS/ ABB/ LEGRAND
4	DISTRIBUTION BOARD	SCHNEIDER/ L&T/ SIEMENS/ ABB/ LEGRAND
5	SWITCH & SOCKET	NORYSIS/ NORTH WEST/ LEGRAND
6	AMMETER, VOLTMETER	AE/ MECO/ UNIVERSAL/ RISHAB/ CONZERVE
7	KWH,PF, FREQUENCY METER	AE/ MECO/ UNIVERSAL/ RISHAB/ CONZERVE
8	DIGITAL METERS / INTELLIGENT MULTIFUNCTIONAL DIGITAL METER	CONSERVE / HPL / L&T / RISHAB/SECCURE/ SIEMENS. (The approved OEM of HT/LT Panel manufacturers shall be permitted
9	SELECTOR SWITCH, PUSH, BUTTON SWITCH / EMERGENCY SWITCH	KAY CEE / CONTROL & SWITCH GEARS / L&T / SCHENIDER / TEKNIC / SIEMENS (The approved OEM of LT/HT Panel manufacturers shall be permitted).
10	LED INDICATION LAMPS	KAY CEE / CONTROL & SWITCH GEARS / L&T / SCHENIDER / TEKNIC/ SIEMENS.(The approved OEM of HT/LT Panel manufacturers shall be permitted).
11	CT AND PT	AE / KAPPA / UNIVERSAL / KAYCEE / IMP/ C &S/L&T/MECO/KAPCO/CROMPTON GREAVES (The approved OEM of HT / LT Panel manufacturers shall be permitted).
12	PROTECTIVE RELAYS/CONTACTORS	EASUN REYROLLE / L&T / ABB / SIEMENS/C&S
13	OIL TYPE TRANSFORMERS	VOLTAMP/ KIRLOSKAR / ABB / CROMPTON GREAVES
14	LIGHTINING ARRESTOR	LAMCO / ATLAS / OBLUM
15	TIME SWITCH	LEGRAND/ ABB/ L&T
16	PVC CONDUIT AND ACCESSORIES	MALHOTRA/ AKG/ BARELLIA
17	CAPACITOR PANEL	SCHNEIDER/ L&T/ ABB/ SIEMENS
18	DG Synchronizing panel	KILOSKAR/ CUMMINS/ JACKSON
19	PORTABLE FIRE EXTINGUISHER	INTIME/ LIFEGUARD/ ECO FIRE/ SAFEX
20	CABLE TRAY	OBO/ LEGRAND/ SCHNEIDER/ ABB
21	HT/LT CABLES AND WIRES	FINOLEX/ RR KABEL/ POLYCAB/ HAVELLS
22	33KV HT PANEL WITH VCB	ABB / SCHNIDER / SIEMENS