**TENDER DOCUMENT**

**(e-Procurement)**

**Tender No: IISc/Tender-ELE-04/2023-24**

**For**

**Supply Installation Testing and Commissioning of Compact Substation for new buildings in IISc Bangalore**

**Office of the Project Engineer cum Estate officer**

**Centre for Campus Management and Development Indian Institute of Science**

**Indian Institute of Science Bangalore – 560012**

**080-2293-2202/2765**

**Website : https://iisc.ac.in/all-tenders/**

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1. **Tender Notification**

**Tender No: IISc/Tender-ELE-04/2023-24**

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|---|---|
| Name of work | **Supply, Installation, Testing and Commissioning of Compact Substation for new buildings in IISc, Bangalore.** |
| Estimated Value of work | **Rs.5,17,21,488.00(Incl. GST)** |
| Period of Work Completion | 5 Months |
| Name of the Client | Indian Institute of Science, Bangalore |
| Address of the Client | The Registrar<br>Indian Institute of Science<br>Bangalore – 560 012<br>Tel No. 080-2293 2008/2202<br>e-mail: office.ccmd@iisc.ac.in |
| Submission of Tender Document | e-procurement portal-<br>https://eprocure.gov.in/eprocure/app<br>Helpline no: 0120-4001005 |
| Earnest Money to be deposited with the Tender | **Rs.7,75,822.00** (1.5% of the Estimated Cost) |
| Last date and Time for online submission (uploading) of tender | **16.11.2023 at 1530Hrs** |
| Date and Time of opening of Tender (Technical Bid) | **17.11.2023 at 1530Hrs** |
| Date and Time of opening of Tender (Financial Bid) | Shall be intimated to technically qualified bidders thro' CPP portal. |
| Pre-bid meeting Date, Time & Venue | **03.11.2023 at 1430 Hrs**<br>Pre bid meeting will be held on Teams App. The web link will be forwarded to the intending bidders. They are requested to send the request to the email id: office.ccmd@iisc.ac.in<br>**Queries can be mailed in prior to the same mail.** |

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**Notice Inviting Tender**

The Registrar, Indian Institute of Science invites tenders in two bids (Technical and Financial) system from eligible Bidders, for **"Supply, Installation, Testing and Commissioning of Compact Substation for new buildings in IISc, Bangalore."**

Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of India or any State Government of Union of India. (Authorized signatory should provide an undertaking). Tenders from Joint ventures are not acceptable.

2.1 All Bidders shall provide the required information accurately and enough as per details in Section 4: Eligibility Criteria

2.2 The Tenderer shall upload the valid copies of the documents as mentioned in the Chapter-4 (Eligibility criteria) in technical bid**, failing which the tender will be rejected**. If necessary, bidder shall produce all the original documents for verification.

2.3 The work shall be carried out as per the directions of the Project Engineer cum Estate Officer.

2.4 Blacklisted contractors in State / Central Govt. Departments / BBMP / PSU/ Central PSUs/ Autonomous bodies / Institutions are not eligible to quote, if found such tenders will be rejected.

2.5 The successful Bidder shall execute an Agreement within 10 days from the date of Receipt of intimation from this office, The Tender Document will form the part and parcel of the agreement, failing which the tender will deem to be get cancelled.

2.6 The material shall be got approved by the Project Engineer cum Estate Officer, IISc before execution of the work.

2.7 Further details of the work can be obtained from this office.

2.8 The rates quoted should reflect all taxes. The bid evaluation will be done inclusive of all Taxes / Cess. / Royalty etc. The statutory levies as per Govt. guidelines will be deducted. The IISc reserves the right to accept / reject any or all the tenders without assigning any reasons.

2.9 The work shall be commenced with all manpower, material, machinery & requisite resources within 10 days from the date of work order, failing which it would be presumed that the successful tenderer is not interested in the work and action will be taken to get the work executed through alternate agency at the risk and cost of the former Tenderer.

2.10 Conditional tenders will not be accepted and is liable for rejection.

2.11 Bidders who meet the specified minimum qualifying criteria, shall be eligible.

2.12 Even though the Bidders meet the eligibility criteria mentioned in Section-4 they are subject to be disqualified if they have:

- Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
- Record of poor performance such as abandoning the works, not properly completed the contract, inordinate delays in completion, litigation history, or financial failures etc.

**2.15 Site visit:**

The Bidder at his own responsibility is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Tender and entering into a contract for the Works. The cost of visiting the Site shall be at the Bidder's own expense.

2.16 The Tender document can be downloaded from e-procurement website: https://eprocure.gov.in/eprocure/app. It may be noted that all subsequent notifications, changes and amendments on the project/document would be posted only on the same

website. The bidders are advised to visit e-procurement portal and get familiarized with the procedure for submission of the tenders.

2.17 **Content of Tender documents**

The bidders should go through the Tender Document and submit online response through e-procurement portal only.

**2.18 Amendment of Tender documents**

Before the deadline for submission of tenders, the IISc may modify the tender documents by issuing corrigendum / addendum.

Such corrigendum/ addendum thus issued shall be part of the tender documents and shall be published online in e-Procurement portal.

Prospective Bidders will be given reasonable time for submitting the bid by taking the corrigendum/ addendum into account.

**2.19 Documents comprising the Tender**

**The Technical Bid** submitted by the Bidder shall contain the documents as follows:

a) Earnest Money Deposit paid in the specified form as mentioned in the e-Procurement platform.

b) Qualification Information as per formats to comply the task created in the e-Procurement Portal under General Terms and Conditions and Technical parameters and Documents required from Bidder.

c) Any other documents / materials required to be completed and submitted by Bidders in accordance with these instructions. The required documents shall be filled in without exception.

**The bidder shall submit the hard copies of the documents / credentials which are uploaded in the tender portal. The documents shall reach the designated office within 3 days from the tender opening date.**

The Financial bid shall be submitted by the bidder through e-procurement portal only and no hard copy of financial bid should be attached or disclosed.

The contract shall be for category of works / whole works based on the priced Bill of Quantities submitted by the Bidder.

All prevailing duties, taxes, and other levies like CESS/Royalty payable by the contractor under the contract, or for any other cause, shall be included in the rates, prices and total Tender Price submitted by the Bidder.

**2.20 Tender validity**

Tenders shall remain valid for a period not less than **180 days** after the deadline date for tender submission. A tender valid for a shorter period shall be rejected by the IISc as non-responsive.

In exceptional circumstances, prior to expiry of the original time limit, the IISc. may request that the Bidders may extend the period of validity for a specified additional period. The request and the Bidders' responses shall be made in writing or by email. A Bidder may refuse the request without forfeiting his earnest money deposit. A Bidder agreeing to the request will not be required or permitted to modify his tender but will be required to extend the validity of his earnest money deposit for a period of the extension, and in compliance with Clause 2.18 and 2.22 in all respects.

**2.21 Earnest money deposit:**

The Bidder shall furnish, as part of his tender, earnest money deposit (EMD). The Bidder has to pay the Earnest Money Deposit (EMD) in the form of Demand draft drawn on “The Registrar, IISc” payable at “Bangalore”.

The bidder has to scan the demand draft and submit it with Technical Bid Documents for our reference. The original DDs has to be submitted along with the hard copies of all the

documents in a sealed cover as a pre-qualification bid (Technical bid) which were uploaded through e-procurement portal.

The EMD amount will have to be submitted by the bidder taking into account the following conditions:

a) The entire amount must be paid in a single transaction.
b) The earnest money deposit of unsuccessful Bidders will be returned after awarding the contract to the successful bidder.

The earnest money deposit may be forfeited:
a) If the Bidder withdraws the tender after tender opening during the period of tender validity,
b) If the Bidder fails within the specified time limit to
i) Sign the Agreement; or
ii) Furnish the required Security deposit

**2.22 Provisions for Micro and Small Enterprises (MSE):**

The MSE registered bidder should upload the registration certificate in the CPP portal along with the technical bid documents. The MSE registration to specify manufacturing / service of the tender item (s).

Policy is meant for procurement of only goods produced and services rendered by MSEs. However, traders are excluded from the purview of Public Procurement Policy.

Participating Micro and Small Enterprises quoting price within price band of L1+15%, will qualify to supply a portion of requirement by bringing down price to L1 price in a situation where L1 price is from someone other than a Micro and Small Enterprises.

**2.23 Format and signing of Tender**

Successful Bidder shall sign all the pages of the tender document as a token of acceptance of all the terms and conditions of the contract.

**2.24 Submission of Tenders**

Tenders must be submitted on-line in the e-Procurement portal by the Bidder before the notified date and time.

**2.25 Deadline for submission of the Tenders**

The Bidder shall submit a set of hard copies of all the documents in a sealed cover to IISc required as a pre-qualification bid (Technical bid) which were uploaded through e-procurement portal. In the event of any discrepancy between them, the original uploaded document in e-procurement shall govern.

The IISc may extend the deadline for submission of tenders by issuing an amendment, in which case all rights and obligations of the IISc and the Bidders previously subject to the original deadline will then be subject to the new deadline.

**2.26 Late Tenders**

In e-procurement system, Bidder shall not be able to submit the bid after the bid submission time and date as the icon or the task in the e-procurement portal will not be available. IISc will not be liable (or) responsible for any delay due to unavailability of the portal and the Internet link.

**2.27 Modification and Withdrawal of Tenders**

Bidder has all the time to modify and correct or upload any relevant document in the portal till last date and time for Bid submission, as published in the e-procurement portal.

The Bidder may withdraw his tender before the notified last date and time of tender submission. No Tender may be modified after the deadline for submission of Tenders.

Withdrawal or modification of a Tender between the deadline for submission of Tenders and the expiration of the original period of Tender validity specified in Clause 2.21 above may result in the forfeiture of the earnest money deposit.

2.28 **Tender Opening:**

The IISc will open all the Tenders received through' online mode, in the presence of the Bidders or their representatives who choose to attend on the specified date, time and place specified. In the event of the specified date of Tender opening being declared a holiday for the IISc. The Tenders will be opened at the appointed time and location on the next working day.

The IISc will evaluate and determine whether each tender meets the minimum qualification eligibility criteria.

Bidder to submit all the Original Documents, which are submitted in e-procurement portal, to the IISc for verification at the time of opening of Tender. The IISc will record the Tender opening.

**2.29 Process to be confidential.**

Information relating to the examination, clarification, evaluation, and comparison of Tenders and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced.

**2.30 Clarification of Tenders**

To assist in the examination, evaluation, the IISc may, at his discretion, ask any Bidder for clarification of his Tender. The request for clarification and the response shall be in writing or by e-mail along with the section number, page number and subject of clarification, but no change in the price or substance of the Tender shall be sought, offered, or permitted.

Subject to clause 2.31, no Bidder shall contact the IISc on any matter relating to its Tender from the time of the Tender opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the IISc, he/she should do so in writing.

Any effort by the Bidder to influence the IISc in the Tender evaluation, or contract award decisions may result in the rejection of the Bidders' Tender.

2.31 **Examination of Tenders and determination of responsiveness**

Prior to the detailed evaluation of Tenders, the IISc will determine whether each Tender (a) meets the eligibility criteria (b) is accompanied by the required earnest money deposit and; (c) is substantially responsive to the requirements of the Tender documents.

A substantially responsive Tender is one which conforms to all the terms, conditions, and specifications of the Tender documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Tender documents, the IISc's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Tenders.

If a Tender is not substantially responsive, it will be rejected by the IISc., and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

**2.32 Correction of errors**

No corrections to uploaded bid is permitted by the portal. Tenders determined to be substantially responsive will be checked by IISc.

2.33 **Evaluation and comparison of Tenders**

Opening of the Financial bid will be preceded by the evaluation of the Pre-qualification Offer (Technical bid), vis-a-vis the capability, capacity and credibility of the Bidder. Evaluation of the Prequalification Offer will be done by the Evaluation Committee constituted for the

purpose. After evaluation is completed, all the Bidders who are qualified will be notified and will be intimated at the time of opening of the Financial bid. Financial bid will be opened in the presence of those who choose to be present or even in the absence of any Bidder.

The IISc will evaluate and compare the Tenders as per comparative statement downloaded from e-procurement portal.

In evaluating the Tenders, the IISc. will determine for each Tender the evaluated Tender Price by adjusting the Tender Price as follows:

a) Making any correction for errors and

b) Making appropriate adjustments to reflect discounts or other price modifications offered

The IISc reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the Tender documents or otherwise result in unsolicited benefits for the IISc shall not be taken into account in Tender evaluation.

**2.34 Negotiations**

The Bidder though technically qualified and whose financial offer is the lowest, fails to convince the Tender Evaluation Committee of his capability, capacity, credibility, his offer may be reviewed, and the Bidder intimated accordingly. In such case, the Bidder, who has quoted the lowest price, may be considered and his price may be negotiated as advised by the tender committee.

**2.35 Award criteria**

Subject to Clause 2.36, the IISc will award the Contract to the Bidder whose Tender has been determined to be substantially responsive to the Tender documents and who has offered the lowest evaluated Tender Price. After technical evaluation the technically qualified bidders will be considered for opening of the financial bids provided that such Bidder has been determined to be eligible in accordance with the provisions of this tender document and subsequent technical clarifications offered by the responsive bidders.

**2.36 Right to accept any Tender and to reject any or all Tenders**

Notwithstanding Clause 2.35, the IISc reserves the right to accept or reject any Tender, and to cancel the Tender process and reject all Tenders, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the IISc's action.

**2.37 Notification of award and signing of Agreement**

The Bidder whose Tender has been accepted will be notified of the award by the IISc. prior to expiration of the Tender validity period by e-mail or confirmed by letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the IISc. will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of clause 2.39

The Agreement will incorporate all agreements between the IISc and the successful Bidder /Bidders. It will be kept ready for signature of the successful Bidder in the office of IISc. Following the notification of award along with the Letter of intent. The successful Bidder will sign the Agreement and deliver it to the IISc.

Upon the furnishing by the successful Bidder of the Security deposit, the IISc will issue formal work order.

The successful bidder is required to sign an agreement for the due fulfilment of the contract and start the work immediately on of the acceptance of his tender. A draft of the Articles of

the Agreement is enclosed. The Earnest Money will be forfeited and at the absolute disposal of the Employer if the Contractor defaults from signing the Agreement of in starting the work.

**2.38 Security deposit (SD)**

Further percentage on the running bills and final bill in addition to Earnest Money Deposit shall be levied from the contractor. When the SD deducted from R.A Bills of the contractor **@ 6%** of the bill amount exceeds Rs.1.00 Lakh, the amount in excess of Rs. 1.00 Lakh may, at the request of the bidder, be released to him against the production of the bank guarantee issued from a Nationalized/Scheduled bank only for an equal amount in the prescribed form. The bank guarantee should be valid till the completion of the defect liability period.

If the security deposit is provided by the successful bidder in the form of a Bank Guarantee, it shall be issued either by a Nationalized/Scheduled bank.

Failure of the successful Bidder to comply with the requirements of clause 2.38 shall constitute sufficient grounds for cancellation of the award and forfeiture of the earnest money deposit.

**2.39 Corrupt or Fraudulent practices**

The IISc requires that the Bidders observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, IISc.

a) will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.

b) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a IISc contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a IISc contract.

**2.40 Payment Terms**

For Civil works: Monthly running account bills.

For Electrical works: 80% against the supply of material and 10% after installation and 10% after testing and commissioning, subject to the other provisions of the tender document.

2.41 Work done as a sub- contractor under a prime contractor will not be considered for qualification. **"Prime Contractor"** means a firm that performs a construction work itself and that the work is directly entrusted to the firm by the owner/ government/ local body/ quasi government/ Government undertaking bodies.

**2.42 <u>Make in India</u>**

Only "Class–I and Class-II local supplier will be eligible to bid notified vide (DPIIT) Notification No. P-45021/2/2017-PP (BE-II) dated 4th June 2020 amended from time to time.

**Declaration of Tenderer**

**Name of Work**: "**Supply, Installation, Testing and Commissioning of Compact Substation for new buildings in IISc, Bangalore.**"

3.1 I/We, declare that specifications, plans, designs and conditions of contract on which the rates have been quoted are completely studied by me/us before submitting this tender.

3.2 I/We declare that I/We have inspected the work spot and have made myself/ourselves thoroughly conversant and satisfied as regards the field conditions prevalent there, regarding the materials, labour and the particulars of various leads with which the materials required to be brought for the work.

3.3 I/We, declare that the rates quoted for items of works for which now tenders are called for are inclusive of leads with which I/We propose to bring the materials. I/We will not have any claims for higher leads, and my/our quoted rates are with all leads and lifts etc.,

3.4 I/We, declare that the rates tendered by me/us for this work have not been witnessed by any other contractor/s who has/have tendered for this work.

3.5 I/We, declare that I/We, have understood all the conditions mentioned above and also the specifications stipulated in tender condition either by going through myself/ourselves or by getting translated into my/our own mother tongue.

## 3 Eligibility Criteria

**Technical Criteria:**

4.1– Any specialised firms company registered under KPWD /CPWD/ railways/ MES/ central PSUs/ or any Government department of class I / Class A civil contractors are eligible to apply.

4.2 The Bidder should have Experience of having a successfully completed either of the following works:

(a) Three (03) completed works each costing not less than **40%** (forty percent) of the estimated cost i.e. **Rs.2,06,88,595.00**

**(Or)**

(b) Two (02) completed works each costing not less than **60%** (Sixty percent) of the estimated cost i.e. **Rs.3,10,32,893.00**

**(Or)**

(c) One (01) completed work costing not less than **80%** (eighty percent) of the estimated cost i.e. **Rs.4,13,77,190.00**

**Note: The Experience certificate / work order should be in the same registered name as per Clause 4.1 and not as a joint venture.**

The works should have been completed in last seven (7) consecutive years .

**Financial Criteria**

4.3 The bidder should have registered for a minimum period of Ten years.

4.4 The average annual financial gross turnover should be **30%** of estimated cost in that last five years.

4.5 The minimum annual financial turnover for the two consecutive years should be **30%** of estimated cost.

4.6 The bidder should have not incurred any loss in more than two years. The bidder should submit the **solvency certificate** from the bank for 30% of estimated cost. The Solvency should not be more than Six-month-Old ending last day of the month, previous to the month in which tender is invited.

4.7 The average net worth of the bidder as of **2022-23** should be not less than 25% of estimated cost. Necessary certificate by the Charted Accountant shall be submitted.

4.8 The bidder should have not been blacklisted by any State / Central Govt. Departments / BBMP / PSU/ Central PSUs/ Autonomous bodies / Institutions.

4.9 The bidding capacity of the bidder should be 75% or more of the estimated cost.

The bidder should possess the bidding capacity as calculated by the following formula.

Available bid capacity = A x M x N -B, where

A = Maximum value of engineering (Civil/ Electrical/ Mechanical as relevant to work being procured) works executed in any one year during the last five years (updated at the current price level), taking into account the completed as well as works in progress.

M = Multiplier Factor (usually 1.5)

N = Number of years prescribed for completion of the work in question.

B = Value (updated at the current price level) of the existing commitments and ongoing works to be completed in the next 'N' years.

4.10 Information on works for which tenders have been submitted and ongoing works as on the date of this Tender.

(A) Existing commitments and on-going works:

| Description of work | Place & State | Contract number & date | Name & address of the customer | Value of Contract in Lakhs | Stipulated period of completion | Value of work remaining to be completed in Lakhs | Anticipated date of completion |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |

[Details to be furnished with necessary work order signed from concerned project in-charge not below the rank of Executive Engineer or Competent Authority. The Work order/Testimonials will be verified, if required]

(B) Works for which Tenders already submitted:

| Description of work | Place & State | Name & address of the customer | Estimated value of work in lakhs | Stipulated period of completion | Date when decision is expected | Remark if any |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| | | | | | | |

4.11 Certificate from Charted Account stating turn over for the last five years is also to be uploaded.

| Sl.No | Year | Turn over amount | Remark |
|---|---|---|---|
| 1 | 2018-19 | | |
| 2 | 2019-20 | | |
| 3 | 2020-21 | | |
| 4 | 2021-22 | | |
| 5 | 2022-23 | | |

**Litigation and Arbitral Issues:**

4.12 Net pending litigations should not be more than 50% of bidder's net worth. As a supporting document of undertaking letter to be submitted by Bidder. It must be certified by Authorized Legal person / lawyer.

4.13 No consistent history of court/arbitral award decisions against the bidder for the last five years. As a supporting document of under letter to be submitted by Bidder. It must be confirmed by Authorized Legal person / lawyer.

## 4 Special Conditions

5.1.1 Establishment of Labor Camp is strictly prohibited in the premises of Indian Institute of Science Campus. Essential labor for round the clock work at site will be allowed with prior permission of Project Engineer cum Estate Officer.

5.1.2 Any damage to the existing service lines during execution of work shall be got rectified by the bidder at his own cost and risk.

5.1.3 Debris shall be disposed-off to an undisputed place of Bangalore outskirts as per the direction of the Engineer-in-Charge, whenever required.

5.1.4 Labor employed at the site will not be allowed to use cellphone while working at the site.

5.1.5 Supply of Electricity: - Electricity required for construction shall be arranged by the contractor himself. Electricity if supplied to the contractor by the Institute will be metered and amount will be recovered in the Bills as per actual at rates fixed by the Institute. Supply of electricity from the Institute is not mandatory. Non-supply of electricity by the Institute cannot be held as reason for shortfall in progress.

5.1.6 Water supply: The Contractor has to make his own arrangement for water supply. However, if water supply to the site at one convenient point is made available by the Institute, the charges for the consumption of water will be borne by the Contractor at 1.50% of the value of the work.

5.2 Schedule of Quantities (Bill of Quantities) is attached herewith. It should, however, be clearly understood that these quantities are liable to alterations by omission, addition or variation, at the discretion of the Architects/Project Engineer Cum Estate Officer.

5.3 The drawings together with specifications and conditions of contract are enclosed. These should be studied carefully by the intending tenderers. In the absence of specifications for any item of work, material or ingredient in the specifications, CPWD/MoRTH specifications shall be followed and in the absence of specification for any item, materials are ingredient shall be fixed in all respects in accordance with the instructions and requirements of the Project Engineer Cum Estate Officer, the work will be the best of the kind.

5.4 The tenderer is expected to inspect the site and acquaint himself with the local conditions and will be deemed to have so done before submitting the tender.

5.5 The rates quoted shall be for finished work and shall include for all necessary incidental work. Sales or any other tax on materials in respect of this contract will be payable by the Contractor. The Contractors cannot presume any details regarding the contract.

5.6 It is entirely the responsibility of the Contractor to arrange for and provide all materials required for successful completion of the work except such special materials that may be supplied if any.

5.7 Tenders determined to be substantially responsive will be checked by IISc for any arithmetic errors. Errors will be corrected by the IISc as follows.

5.8 Where there is discrepancy between the rates in figures and in words, the lower of the two will be governed.

5.9 Where there is a discrepancy between the unit rate and the line-item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will be governed.

5.10 Where there is a discrepancy in entries of unit rate between the Original and Duplicate, the lower will govern.

5.11 The Contractor should make his own arrangements to cover the all-round construction area, by providing polyester net/polythene sheet/barricading to avoid inconvenience to other surrounding departments, as directed by the Project Engineer-cum-Estate Officer of the work.

5.12 The debris arise during the period of construction will have to be cleared then and there to keep the surroundings clean and tidy. Such debris shall, if not cleared, be cleared at contractor's risk and cost.

5.13 The contractor shall vacate the campus premises with all his men/ materials immediately after completion of the project.

## 5 GENERAL CONDITIONS

6.1 **DEFINITIONS OF TERMS**

In constituting these conditions and specifications, the following expressions shall have the meaning, therein assigned to them unless there is something repugnant in the subject of context in consisting with such meanings.

6.2 Institute shall mean the "Indian Institute of Science, Bangalore".

6.3 "Office" shall refer to the Office of the Project Engineer cum Estate officer.

6.4 "Contractors" shall mean the tenderer whether a firm, registered company, partnership or any individual whose tender has been accepted by Institute or by an Officer (duly authorized in this behalf) on behalf of the Institute and who has entered into agreement with Institute for due fulfillment of the contract and shall include the legal representatives, successors, heirs and assignees of the tenderer.

6.5 "Engineer" shall mean the "Project Engineer cum Estate officer", Indian Institute of Science, Bangalore or such other officer as may be appointed to call as the Project Engineer cum Estate officer for the purpose of the contract and shall also mean and include other officers of equivalent rank directly in charge of the work or any part thereof under administrative control of the Director, IISc, Bangalore-12.

6.6 When the Engineer is named as final authority, it includes all the above-mentioned officers and, in such matters, the contractors shall have the right of appeal against the orders up to the Director, IISc, Bangalore, whose decision shall be final and legally binding on all the parties concerned.

6.7 The Project Engineer cum Estate officer named as final authority for any decision taken, shall mean only the Director, IISc, Bangalore or his duly authorized assistant.

6.8 The Engineer in charge shall mean the Project Engineer cum Estate officer directly in charge of the work or his duly authorized assistants.

6.9 Plant shall mean and include any or all plants, machinery, tools and other implements of all description necessary for the execution of the work in a safe and workmen like manner.

6.10 The expression "Works" where used in these conditions shall unless thereby something in the subject or contract repayment to such construction, be construed to mean the work or the works constructed to be executed under or virtue of the contract whether temporary or permanent and whether original, altered, substituted or additional.

6.11 "Contract and contract document" shall mean and include the notice inviting tenders, proceedings of the pre bid meeting, the stamped agreement, conditions of contract, specifications and Schedules 'B', drawings and all other connected documents with tender schedule.

6.12 "Specifications" shall mean the specifications annexed and where these are not specifically mentioned shall be as may be detailed and necessary due to particular nature of work as approved by the Project Engineer cum Estate officer.

6.13 "Site" shall mean and include all the area in which operations in respect of the work are carried out. This shall also include materials stacking yards and the area where temporary structures are put up for installing any machinery etc.

6.14 "Tests" shall mean such tests as are required to be carried out either by the contractor or by the Project Engineer cum Estate officer from time to time on completion as detailed in the specifications before the work is certified as being satisfactory and is taken over by the Project Engineer cum Estate officer.

6.15 "Month" shall mean a Calendar month.

6.16 "Prime contractor" means a firm that performs construction work itself and that the work is directly entrusted to the firm by the owner / Government / local body / Quasi

Government / Government undertaking. Words used in singular shall also include the plural & vice-versa where the context so demands.

6.17 **CONTRACTOR TO INSPECT SITE**:

The contractor shall visit and examine the construction site and satisfy himself as to the nature of the existing roads or other means of communications, the character of the soil for the excavations, the extent and magnitude of the work and facilities for obtaining materials and shall obtain generally his own information on all matters affecting the execution of the work. No extra for charges made in consequence of any misunderstanding or incorrect information on any of these points or on the grounds of insufficient description will be allowed. All expenses incurred by the contractor in connection with obtaining information for submitting this tender including his visits to the site or efforts in compiling the tender shall be borne by the Tenderer and no claims for reimbursement thereof shall be entertained. .

6.18 ACCESS TO SITE:

The Contractor is to include in his rates for forming access to the site, with all temporary roads and gangways required for the works.

6.19 SETTING OUT:

The Contractor shall set out the building in accordance with the plans. All grid/center lines shall be pegged out to the satisfaction of the Engineer. The Contractor shall be responsible for the correctness of the lining out and any inaccuracies are to be rectified at his own expense. He will be responsible for taking ground levels of the site before setting out and recording them without any extra charge.

The Contractor shall construct and maintain proper benchmark at the intersection of all main walls, columns, etc., in order that the lines and levels may be accurately checked at all times.

6.20 **TREASURE TROVE**:

Should any treasure, fossils, minerals, or works of art of antique interest be found during excavation or while carrying out the works, the Contractor shall give immediate notice to the Engineer of any such discovery and shall make over such finds to the Institute.

6.21 **ACCESS FOR INSPECTION:**

The Contractor is to provide at all times during the progress of the works and the maintenance period proper means of access, with ladders, gangways etc., and the necessary attendants to move and adapt as directed for the inspection of measurement of the works by the Engineer or their representatives.

6.22 **ATTENDANCE UPON ALL TRADERS:**

The Contractor shall be required to permit tradesmen/ Specialized agencies appointed by the employer to execute works like water supply, Sanitary, Electrical installation, lifts, air conditioning, hardware and other specialized works. The contractor shall also permit the above mentioned agencies to use his scaffolding and retain the scaffolding till such works are completed. The rates quoted by the contractor shall be inclusive of the above facility.

6.23 **GATEKEEPER AND WATCHMAN:**

The Contractor from the time of being placed in possession of the site must make arrangements for watching, lighting and protecting the work, all materials, workmen and the public by round the clock on all days including Sundays and holidays at his own risk and cost.

6.24 **STORAGE OF MATERIALS:**

The Contractor shall provide for necessary sheds of adequate dimension for storage and protection of materials like cement, steel, lime, timber and such other materials including tools and equipment which are likely to deteriorate by the action of sun, wind, rain or other natural causes due to exposure in the open. The cement storage site shall be leak proof and shall hold at least 4 months requirement. All such sheds shall be cleared away and the whole area left in good order on completion of the contract to the satisfaction of the Engineer.

All materials which are stored on the site such as bricks, aggregates etc., shall be stacked in such a manner as to facilitate rapid and easy checking of quantities of such materials.

6.25 **COST OF TRANSPORTING**:

The Contractor shall allow in his cost for all transporting, unloading, stacking and storing of supplies of goods and materials for this work on the site and in the places approved from time to time by the Engineer. The Contractor shall allow in his price for transport of all materials controlled or otherwise to the site.

6.26 **W.C. AND SANITARY ACCOMMODATION AND OFFICE ACCESSORIES AND ACCOMMODATION**:

The contractor shall provide at his own cost and expense adequate closet and sanitary accommodation complying in every respect to the rules and regulations in force of the local authorities and other public bodies, for his workmen, for the workmen of nominated sub-contractors and other contractors / specified agencies working in the building, the Project Engineer of works and other Institute agents connected with this building project and maintain the same in good working order.

The Contractor shall also provide at his own expense adequate office accommodation for the Project Engineer of works preferably contiguous to his office and shall maintain the same in a satisfactory condition and shall provide light, fan and attendant etc., for the same and shall remove them after completion of the works. He shall arrange to provide latest survey Instruments and at all times maintain the same in good working order at site, to enable the Project Engineer of works or other representative of Institute to check the lines and levels of the work.

6.27 **MATERIALS**:

Materials shall be of approved quality and the best of their kind available and shall conform to I.S. specifications. The Contractor shall order all the materials required for the execution of work as early as necessary and ensure that such materials are on site well ahead of requirement for use in the work. The work-involved calls for high standard of workmanship combined with speed and to the entire satisfaction of the Project Engineer.

6.28 **TO ASCERTAIN FROM CONTRACTORS FOR THE OTHER TRADES.**

The Contractor shall ascertain from all agencies / Sub-contractors all particulars relating to their work with regard to the order of its execution and the position in which chases, holes and similar items will be required; before the work is taken in hand as no patch works shall be allowed for cutting away work already executed in consequence of any neglect to ascertain these particulars beforehand.

6.29 **SAMPLE APPROVAL:**

Before ordering materials, the Contractor shall get the samples approved from the Project Engineer cum estate officer well in time.

6.30 **TESTING OF WORK AND MATERIAL**:

The Contractor shall, if required by the Engineer arrange to test materials and/or portions of the works at his own cost in order to prove their soundness and efficiency. If after any such test the work or portion of works is found in the opinion of the Engineer to be defective or unsound, the Contractor shall pull down and redo the same at his own cost. Defective materials shall immediately be removed from the site at his own cost.

6.31 **FOREMAN AND TRADESMEN:**

All Tradesmen shall be experienced men properly equipped with suitable tools for carrying out the work of carpentry and joinery and other specialist trades in a first-class manner and where the Engineer deem necessary, the Contractor shall provide such tools which are considered necessary for carrying out of the work in a proper manner.

All such tradesmen shall work under an experienced and properly trained Foreman, who shall be capable of reading and understanding all drawings, pertaining to this work and the contractor shall also comply with other conditions set out in different clauses of the conditions of the contract.

6.32 **PROJECT PROGRAMME OF WORKS AND WEEKLY PROGRESS REPORT**:

**a) Organization chart:**
The contractor should submit the proposed organization chart for the project including the details of staff to be deployed full time on site to the approval of Project Engineer, where the PROJECT ENGINEER raises any objection to either the qualification or experience or required professionalism of any of the staff deployed by the contractor, the same shall be replaced by suitably competent person to the approval of PROJECT ENGINEER within 7 days.

**b) Program chart**:
The Contractor shall furnish the detailed programme of execution for timely completion of the project (inclusive of rainy season). Such a detailed program of works prepared using Industry Standard Scheduling Software like MS Project 2000 or Primavera shall be submitted by the Contractor within ten days after receiving communication of tender acceptance. As per the detailed drawings and schedule of quantities; the contractor shall work out concurrent activities with start and finish times, integrating of all tasks with interface and milestone event drawn and to evaluate for reduction in total project duration through improved over lapping of tasks and activities where feasible. The Contractor shall plan for improved planning and scheduling of activities and forecasting of resource requirements, ability to use the computer effectively to produce timely valid information for Project Management purpose. Accordingly, PERT; CPM Networking shall be drawn. GANNT charts shall also be furnished. The Contractor shall also furnish necessary particulars to the Project Engineer of works for compiling weekly progress reports in the form furnished by the Institute. A monthly financial programme shall also be submitted.

6.33 **CLEARING OF SITE**:
The contractor shall after completion of the work clear the site of all debris and left-over materials at his own expense to the entire satisfaction of the Institute. The same should be carted out of the Institute at his own cost.

The contractor shall also clear the labour camp/RMC plant of all types of permanent/temporary structures, soak pits, sump, septic tanks or any other such installations as identified by the PROJECT ENGINEER to the entire satisfaction of the Institute. The debris/excess stuff shall be carted out of the Institute at his own risk and cost.

6.34 **PHOTOGRAPHS**:
The Contractor shall at his own expense supply to the Institute photographs in duplicate copies not less than 25 cm x 20 cm. (10" x 8") along with soft copy, of the works taken from all the portions of the building at intervals of not more than one week during the progress of the work, or at every important stage of construction, as directed by the Project Engineer of work.

6.35 **PROVISION OF NOTICE BOARD**:
The Contractor shall provide a notice board on proper supports 3m x 2m (10' x 6') in a position approved by the Engineer. He shall allow for painting and lettering stating name of work; name of Architects; Structural Consultants; General Contractor and Sub-Contractors. All letters except that of the name of the work shall be in letters not exceeding 5 cm. in height and all to the approval of the Engineer. Proper barricading shall be erected all-round the site before commencement of the work.

6.36 **PROTECTION:**
The contractor shall properly cover up and protect all work throughout the duration of work until completion, particularly masonry, moldings, steps, terrazzo or floor finishes, staircases

and balustrades, doors and window frames, plaster angles corners lighting and sanitary fittings, glass, paint work and all finishing.

6.37 **PREPARATION OF BUILDING FOR OCCUPATION AND USE ON COMPLETION:**
The whole of the work shall be thoroughly inspected by the Contractors and all deficiencies and defects set right. On completion of such inspection, the Contractor shall inform the Engineer in writing that he has finished the work and it is ready for the Engineer's inspection.

On completion, the Contractor shall clean all windows and doors and all glass panes, including cleaning of all floors, staircases and every part of the building including oiling of all hardware. He will leave the entire building neat and clean and ready for immediate occupation and to the satisfaction of the Engineer.

6.38 The tenderer must understand clearly that the rates quoted are for complete items of works including charges due to materials, labour, all lead and lift, HOM of plant and machineries, scaffolding, supervision, service works, power, all types of royalties, sales tax, labor cess, all types of taxes payable to the Govt and local bodies, overhead charges, etc., and includes all extra to cover the cost of night work if and when required and no claim for additional payment beyond the prices or rates quoted will be entertained for payment subsequently towards any claims on the grounds of misrepresentation or on point that he was supplied with information given by promise or guarantee by the Institute, or by any person whether member of or employee in Institute will not be entertained. Failure on the contractor's part to obtain all necessary information for the purpose of submitting his tender and quoting rates therein shall not absolve him of any risk or liability consequent upon the submission for tender.

6.39 All the works shall be carried out as per specifications prescribed by BIS, National Building code, CPWD / KPWD specifications, relevant IS codes or as directed by the Project Engineer in the absence thereof.

6.40 In case there is any conflict in the specifications and drawings the decision of the Project Engineer cum Estate officer shall be final and binding on the contractor.

6.41 All the materials shall be got approved by the Project Engineer cum Estate officer before use.

6.42 The rates quoted for in individual items shall include labour, cost of materials conveyance and lift charges for all materials required for successful completion of work and all taxes payable to any authority as per rules in vogue from time to time.

6.43 Necessary pillars shall be constructed by the Contractor for benchmark at no extra cost as directed by the Project Engineer.

6.44 Site order book shall be maintained in the work spot and the contractor shall sign in the order book in token of having gone through the instructions issued by the inspecting officers and carryout the instructions promptly.

6.45 In the work spot the contractor shall provide suitable temporary office with a covered area of 1000 sq.ft matching that of the Contractor's office with necessary furniture for use of Institute as directed by the Project Engineer for which no extra payment or compensation shall be claimed. The furniture however will after completion of the work, be the property of the contractor and shall remove them at the close of the contract.

6.46 The contractor shall take all precautions against damage from accident. No compensation will be allowed to the contractors for their tools and plant materials lost or damaged from any cause. The contractor is liable to make good the structure or plants damaged by any other cause at his own cost. The Institute will not pay the contractor for corrections or repairing any damaged portion of work done during construction.

6.47 The contractor shall employ adequate no. of skilled & unskilled labours required for successful timely execution of work. He shall submit daily reports to the Engineer in charge

regarding the strength of labour employed both skilled and unskilled.

6.48 The contractor shall furnish weekly medical report showing number of persons ill or incapacitated and nature of their illness, to the Project Engineer.

6.49 The contractor shall furnish a report of any accident which may occur, within 24 hours of its occurrence to the Project Engineer.

6.50 The contractor shall keep on site of work a qualified Engineer as required as per rules of registration as their authorized representative who will receive all instructions given from the Institute officers. The representative shall have permanent office at site of work where communications can be sent and notices can be served by the Project Engineer throughout the duration of work.

6.51 Prior approval should be obtained from the Project Engineer for the construction and location of the temporary site office, store sheds and labour quarters, within the premises of the site, similarly the contractor shall get approval of the Project Engineer regarding the areas to be utilized for stacking the materials etc., for the work.

6.52 Reference to detailed specifications are indicated against the items contained in the Schedule 'B', in case there is any item for which no detailed specifications is indicated, it shall be carried out as per specifications intimated by the Project Engineer. The contractor shall not be entitled for any extra claims or compensation on this account. In case of additional or extra items not covered by the Schedule 'B', the contractor shall carry out the work as per specifications intimated by the Project Engineer.

6.53 The Engineer shall have the right to direct the contractor to progress the various items of works in the manner prescribed by him.

6.54 Failure to adhere to any of the above will be sufficient cause for taking action under clause (2) or clause (3) or both along with their sub clauses of conditions of contract.

6.55 Contractor shall make arrangements at his own cost to construct approach road for conveyance of materials etc., preferably on the alignment accepted by the Institute to procure land etc. for housing, staff and workmen near the site of the work.

6.56 It is not possible for the Institute to release any quarry (metal and sand etc.,) for this work. The contractor has to make his own arrangements. No claim regarding leads and lift will be accepted.

6.57 The contractor has to make his own arrangements in regard to power supply and water required for construction and drinking water facilities.

6.58 Tool, Tax, Octroi, Royalty for collecting earth, gravel, sand, stone, excise duty, sales tax, labour cess or any other tax payable on account of this contract shall be met by Contractor.

6.59 The contractor shall be entirely responsible for sufficiency of the scaffolding, timbering, machinery, tools, implement and generally of all means used for fulfillment of the work. Whether such means may not be approved or recommended by the Project Engineer, the contractor must accept at his own cost all risks of accidents or damages.

6.60 After completion of the work, service drawings as per actual execution in Auto CAD should be submitted by the agency for services such as Electrical, Water supply and Sanitary before submission of final bill.

6.61 Extra care shall be taken regarding the laborers by providing waist belt, Helmets scaffolding etc. at your own cost and supervision and shall be carried out as per the directions of the Project Engineer.

6.62 WORKMANSHIP AND LABOUR:

The quality of all materials, tools, operators and labour used on the work shall be subject to the approval of the Project Engineer cum Estate officer or his authorized agent who shall have

power to order immediate removal by the contractor any of the above that may not meet with his approval.

In case of failure to carry out orders of removal within the time specified, the Project Engineer or his authorized agents shall get the same removed at the contractor's expense.

6.63 KEEPING DRY AND PUMPING:

Unless otherwise provided for in the contract, the contractor will at his own expense keep all portions of the work free from undue water, whether due to springs, soakage or inclement weather and will use his own implements and machinery for this purpose.

6.64 BAILING OUT OR DEWATERING:

Adequate arrangements shall be made by the contractor for dewatering the foundation trenches and excavation and keeping the same dry while the masonry or concrete work is in progress and till the Project Engineer considers that the mortar is sufficiently set.

The rates for the various items include the cost of shoring, strutting, coffer dam, channels or other incidental devices necessary for diverting the water met within foundation. The cofferdam and the diversion channel shall, however, be maintained in good and working condition till the completion of the structure or until such time, as in the opinion of the Project Engineer till the coffer dam or/and diversion channel is no longer necessary. Bailing out water necessitated by the failure to maintain the cofferdam and diversion channel will not be paid for separately under any conditions.

No extra rate shall be paid for removing any stuff outside, which might find excess due to rains or for reasons whatsoever from the sides or bottom of the foundation trenches and excavation or from also where when the dewatering operations are in progress.

The contractor must assure himself by making the necessary investigation regarding the depths to which foundations are likely to go. If any work is ordered to be done beyond dimensions or deviations marked in the drawings, no extra rate other than the rate for the Undertaking of work quoted by the contractor be paid.

The contractor will make himself arrangements for necessary plant such as Pump, engines, and other materials required in this connection.

6.65 FACILITIES FOR INSPECTION:

The work at all times be open for inspection by the Project Engineer or his duly authorized Assistant and the contractor shall arrange easy access to every part of the work and shall provide such ladders, scaffolding and lifts for this purpose as necessary at his own cost.

6.66 DELIVERY OF WORKS:

The final bill will be prepared after the work is handed over to the Project Engineer or his duly authorized representative in a thoroughly complete, clean, sound and workman like state.

6.67 EXTRA ITEM:

Whenever the contractor is ordered by the Project Engineer or the person duly authorized by him to execute any item of work, which is not in his tender, it shall be the contractors duty to see that the order is duly entered in the order book on the work, unless a separate communication to this effect is received by him, it shall be his duty to get the rates sanctioned for the item by the appropriate authority. For any extra item of work not thus ordered either by any entry in the order book or separate communication, the contractor shall have no claim to payment.

6.68 COMPLIANCE WITH BYELAWS AND PROTECTIONS AGAINST ACCIDENTS, ETC:

Contractor is responsible for complying with all acts, bye-laws, Municipal and other regulations for the provision and maintenance of lights during nights, barricading, providing any other protection that may be necessary and will be liable for all claims that may arise

from accidents of nuisance caused by works.

6.69 DISPUTES:
Disputes on the points between the Project Engineer and the contractors shall be referred to the Center for campus management and Development, whose decision shall be given in writing and shall be final and binding on the contractor.

6.70 TOOLS ETC.,
The contractor shall unless otherwise specially stated in the contract, be responsible for the payment of all import duties, octroi duties, sales tax, quarry fees etc., on all materials and articles brought to site.

6.71 CLEARANCE OF SITE:
The site described and shown on the plan is to be cleared of all obstruction, loose stones and materials, rubbish of all kinds of shrubs and brushwood, the roots being entirely removed. The products of the cleaning to be stacked in such a place and manner as ordered by the Project Engineer.

In jungle clearing all trees not marked for preservation, jungle wood and brushwood shall be cut down and their roots entirely removed up. All wood and materials from the clearings will be property of the Institute and should be stacked as the Engineer in charge directs. Trees shall not be cut without prior permission of the Institute.
All holes or hollow, whether originally existing or produced by digging up roots, shall be carefully filled up with earth well rammed to the required density and leveled off, as may be directed.

6.72 LINE OUT:
The contractor shall use necessary measuring instruments, theodolite, workstation and other materials like flags, strings, pegs, nails, pillars, paints, etc., and also Labour required for ascertaining of the initial ground levels at the different stages of excavation and construction of masonry or other structures at his own cost. Any dispute in regard to the accuracy of the measuring instruments and the device shall be subjected to the final decision of the Engineer-in charge of the work.

6.73 MACHINERY: All the machinery that will be employed on the work shall be approved, efficient and thoroughly, complying with the specifications of each machine or parts and shall have been manufactured by reputed and qualified firms. All the machinery employed on the work shall be open to inspection at all working hours, by the Project Engineer and any defect shall be rectified, repaired, replaced, renewed or remodeled so that its performance in the opinion of the Project Engineer is satisfactory. Any defective part of the machine, which requires replacement, shall be promptly replaced, failing which the Engineer-in-charge, shall be at liberty to cause the defective fittings removed from site of work at the cost of the contractor.

6.74 OPERATORS: The machines shall be in charge of efficient and trained operators, which terms shall include drivers, mechanics or other personnel who are actually operating the machines. The Engineer in-charge has the right to test operators, etc., as deemed necessary by him for the class of machinery, which he is to operate and shall drive out such of the operators who fail in the tests.

6.75 SAFETY PRECAUTION: All reasonable safety precautions for the safety of workers shall be taken. The contractors shall be responsible for the maintenance of all regulations under the Factory Act, workmen's compensation. Minimum wages act and other act for the safety and welfare of the workers employed by him. In addition, the contractors shall provide adequate protection to all workers employed by him against natural elements such as rain, sun, wind etc., during working hours and provide free, pure protected drinking water during working hours.

6.76 NON-STOP OPERATION:
In the continuous or non-stop operations suitable shifts or working hours for each shift shall

be maintained. The contractor is liable for all reasonable extra payment for all extra hours of work done by the workers employed by him.

6.77 TESTS:

The Project Engineer cum Estate officer or his authorized representatives shall have full scope and right of entry at all times to examine and test, measure, count, weigh, take bores, or in any manner satisfy himself that the work executed is according to the specifications and required strength. Any portion of work got disturbed, during such tests, shall be made good by the contractors, without extra cost. The Engineer in charge has the right to change the design proportions, mixes within reasonable limits to ensure requisite strength of the structure. Laboratory for requisite tests shall be established by the Contractor at site only, at his own cost.

6.78 ADEQUATE ARRANGEMENTS TO ACHIEVE PROGRESS:

The Project Engineer shall have the right to advise the contractor on the strength, quality and nature of labour to be employed on work to maintain progress on the work, commensurate with the strength of structure. Similarly, he shall advise the contractor on the nature and adequacy of the machinery that are required on the work.

6.79 DETAILS TO BE FURNISHED FOR ENGAGING SUB-CONTRACTOR FOR SPECIALISED WORKS:

The tenderer shall be required to engage agencies of standing and repute who have experience in executing works of similar nature and magnitude. Such specialized trades cover electrical installation (HT/LT), Lifts, A.C. sanitary and water supply works, firefighting installation and any such other trades as may be directed by the Institute. The successful tenderer shall be required to engage Sub-agencies for such specialized trades only with the prior written approval of the Project Engineer cum Estate officer after giving an opportunity to the Project Engineer cum Estate officer to evaluate the experience and competence of the sub-agency for each trade. In order to ensure implementation of this requirement, it is required that each tenderer shall submit along with his tender, names of three sub-agencies for each trade amongst whom tenderer proposes to engage if successful in the tender. Along with names of sub-agencies for each trade, the tenderer shall furnish in detail the following particulars in respect of each sub-agency.in the format furnished in Technical Bid.

All such information concerning sub-agencies shall be furnished along with the tender. Any tender containing insufficient information in this regard is liable for rejection. In the event of non-compliance of this requirement, the Institute shall have the right to nominate any sub-agency who in their opinion meets the selection criteria. In such event it would be incumbent on the successful tenderer, to accept and appoint then nominated sub-agency without demur and on this account, if there is any additional cost, such cost shall be borne by the successful tenderer. The Institute shall have no liability on this account. The Institute has the right to evaluate the experience, reputation etc., of such sub-agencies and on their approval in writing to the successful tenderer, successful tenderer shall be required to engage only such approved agencies for execution.

If the Institute is not satisfied with the performance or capability of the names in the panel furnished by the tenderer, the successful tenderer shall be required to engage an agency nominated by Institute. In all these matters, there shall be no additional financial implication to the Institute. The successful tenderer shall be required to execute works within the accepted rates only and no claim will be accepted due to the Institute, insistence on engaging any sub-agency. The Institute further reserves the right to instruct the successful tenderer to terminate the work of sub-agency at any time during the contract, if the performance is found unsatisfactory. In such case, the successful tenderer shall be required to furnish a further panel of names from whom a similar selection can be made by the Institute In this instance also, the Institute is not liable for any additional cost. Responsibility for the delay occurred in this process, if any shall rest with the successful

tenderer.

It is the responsibility of the successful tenderer to ensure that the sub-agencies engaged in the work comply with all the clauses in the agreement between the Institute and the successful tender. It shall be responsibility of the successful tenderer to exercise first line supervision on the works executed by his subagencies including supervision on the quality of materials and workmanship and to ensure that the sub agencies comply with the technical specifications, drawings and bill of quantities. The successful tenderer shall also establish competent site organization technically and administratively to ensure that the works of various sub-agencies are supervised and well co-ordinate to ensure proper sequencing of construction and finishing works and to ensure that the overall time schedule is fully complied with.
The detailed construction programme schedule to be furnished by successful tenderer shall include action plan for procurement of materials and execution of works at site for each of the sub-agency and the detailed construction programme schedule shall reflect proper integration of each component of the building to ensure well-coordinated execution so as to complete the project including services within the stipulated time schedule.

6.80 Existing service lines such as electrical, water supply, sewer lines, telephone lines etc., shall be carefully protected and preserved before commencement and during excavation, dismantling /demolition operations. Details of UG facilities shall be provided to the successful tenderer. Any damage caused to the aforesaid service lines, etc., during excavation, demolition/dismantling shall be made good at Contractor's own expense/cost. Restoration of any service lines, which needs to be shifted and found in the proposed site, is the responsibility of the contractor and the agency shall carry out the work as per the direction of Project Engineer the cost of such work will be borne by the Institute.

6.81 Dust nuisance to neighbour shall be minimized by providing and erecting screens to the required height as per direction of Project Engineer cum Estate officer with Aluminium sheets or canvas or other suitable material before commencement of the work. The site shall be cleared off such protection arrangement after virtual completion of work. All the operations shall be carried out strictly in accordance to regulations of municipal and other local authorities and shall be restricted to normal working hours.

6.82 No debris or materials got from dismantlement/demolition the building(s) shall be thrown in the public road causing inconvenience to the traffic and any fine or penalty imposed by local authority for non-compliance of this provision shall be borne by the contractor.

6.83 The Contractor shall be responsible for any injury to persons, animals, or things and for all structural damage to property which may arise from the operation or neglect of himself and or any nominated sub-contractors, contractor's Employees and or third party whether such injury or damage arising from carelessness, accident or any other cause whatsoever, in any way connected with the carrying out the construction/dismantling/demolition.

The contractor shall take required insurance cover with an approved insurance company as provided in the contract and deposit with the Institute well before commencement of construction/ demolition / dismantling.

6.84 **Preservation of trees**: The contractor shall preserve all existing trees in and adjacent to
6.85 the site which does not interfere with the construction as determined by the Engineer-in charge.

6.86 **Drawings and working Details:** The work shall be carried out strictly in accordance with the approved plans and estimates and specifications and as per the instructions of the Engineer-in-charge, and no deviations or changes are permitted without the written order of the Engineer. The designs and drawings enclosed with the tender documents are only typical and tentative. The working drawings and the working details of the several components of works will be prepared and made available at the time of execution and the contractor shall carryout the work in accordance with such working drawings and working

details.

6.87 **Omissions and discrepancies in drawings and instructions:**
In all cases of omissions, doubts or discrepancies in the dimensions or discrepancies in the drawings and item of work, a reference shall be made to the Project Engineer cum Estate officer, whose elucidation and elaboration shall be considered as authorized. The Contractor shall be held responsible for any error that may occur in the work through lack of such reference and precautions.

6.88 The contractor shall be responsible for accuracy for all shapes, dimensions, and Alignments both vertical and horizontal etc., of all the components of the work.

6.89 **Lands for the use of the Contractors Camp:**
The contractor shall have to make his own arrangements at his own cost for construction of living accommodation outside the IISc premises. The Employee shall not provide any space / building for labour camp.

6.90 **Undesirable Person to be removed from site:**
The contractor shall not employ on site any person who is undesirable, if in the opinion of the Project Engineer the person or persons at site of work employed on behalf of the contractor is/are considered undesirable. The Project Engineer shall notify the contractor to this effect and the contractor will be bound by the decision of the Project Engineer to remove such person or persons from the site of work and from the labour camp. The contractor shall not be entitled to any damage or loss on this account. On the contrary, the contractor shall be liable to compensate the Institute for any loss or damage to the Institute property caused by the employment of such person.

6.91 **Labour Statistics**:
The contractor shall submit daily reports on the following:
(a) Total No. of labour employed in the working area.

6.92 **Execution of work during night times:**
The work shall normally be carried out between 08.00 hours and 17.00 hours with a break of one hour and when permitted during night period, the second shift shall be between 17.00 hours and 00 hours with a break of half an hour during night. When ordered to work at night, adequate provision for lighting the working area should be made by the contractor at his cost and got approved by Engineer. The agency shall not be paid extra for the works executed during night.

6.93 **Safety code:**

a) The Contractor at a prominent place at work spot should bring these safety provisions to the notice of all concerned by display on notice board. The persons responsible for compliance of the safety code shall be named therein by the contractor.
b) To ensure effective enforcement of the rules relating to safety precautions, the arrangement made by the contractor shall be open to inspection by the Labour Officer, Engineer or his representatives.
c) All necessary personal safety equipment's as considered adequate by the Engineer should be kept available for immediate use of persons employed at the site and maintained in the good condition and the contractor should take adequate steps to ensure proper use of equipment by those concerned.
d) Workers employed on mixing concrete, cement grout, cement mortar shall be provided with protective footwear protective goggles and protective gloves. Those engaged in mixing or stacking cement or any materials injurious to the eye, nose and mouth shall be provided with a face mask and protective cover free of cost by the contractor.
e) Those engaged in welding work shall be provided with welder's protective eye Shield and gloves. Stonebreakers shall be provided with protective goggle and protective clothing and seated at sufficiently safe intervals.
f) Those engaged in binding and fabricating steel shall be provided with protective

gloves.

g) Those engaged in deep cuts, large rock excavation shall be provided with helmets.
h) All labour / persons at work shall wear helmet compulsorily.
i) When the work is near any place where there is risk of drowning all necessary equipment's shall be kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions should be made for prompt first aid treatment of all injuries likely to be sustained during the course of work.
j) Adequate and suitable caution and danger signal boards shall be prominently exhibited at road/high tension overhead line/where heavy electrical machines are working where overhead cranes or hoist; derricks, winches are working where blasting zone is demarcated. The content of the board shall be in English and the local language for easy identification.
k) All scaffolding, ladder, stairways, gangways, staging, centering, form work and temporary support and safety devices etc., shall be sound in strength and constructed and maintained as such throughout its use. The agency shall obtain approval from Project Engineer cum Estate officer for scaffolding, formwork etc., before commencement of work.
l) No materials on any site of work shall be so stacked as to cause danger or inconvenience to any persons or public.
m) The Contractor shall provide all necessary fencing and lighting to protect the public/working men from accident and shall be bound to bear the expense of defense of every suit action or other proceedings of law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost, which may be awarded in any such suit action or proceedings to any such persons or which may with consent of the contractor be paid to compensate any claims by any such person.
n) No electric cables or apparatus, which is liable to be a source of danger to persons, employed shall remain electrically charged unless a caution Board is put into that effect and close approach to the same is prohibited.
o) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosives. No floor, roof or other portion of any building used for residence shall be so over-loaded with debris or materials so as to render it unsafe.
p) The final disposal of water used for work or removed from work spot as well as the supply used for domestic consumption shall be as directed by the Engineer. The contractor shall make his own arrangement for purification of domestic water supply used by his staff and labour colony and used on the site of work to the satisfaction of the Engineer.

q) The source of drinking water supply/distribution system in workers colony shall be protected from chances of contamination by poisonous materials epidemic causing infections bacteria etc., by maintaining the source and system under adequate hygienic conditions.
r) Notwithstanding the above clauses, there is nothing in this to exempt the contractor to exclude the operations of any other Act or Rules in force of the Central Govt., State Govt.

6.94 **AWARENESS OF SITE CONDITIONS AND CARRYING OUT OF SITE INSPECTION PRIOR TO TENDER SUBMISSION:**

Prior to the preparation and submission of his Tender, the Contractor shall make visits to the site and carry out all the necessary inspections and investigations in order to obtain all information and to make his own assessment of the conditions and constraints at site, including the means of access to it. The Contractor shall make himself aware of all the features of the site and the working conditions and space and shall, in general, be responsible for obtaining all the necessary and requisite information needed for him to prepare and submit his Tender.

Should the Contractor require any clarifications he shall seek these in writing from the Project Engineer before submitting his Tender. At no stage will any extra claims be entertained or allowed on any matter or for any reason arising from or as a consequence of

the Contractor's failure to comply with all the requirements stipulated in this Clause.

6.95 **WORK AND WORKMANSHIP**

To determine the acceptable standard of workmanship, the Project Engineer may order the Contractor to execute certain portions of works and services under the close supervision of the Project Engineer. On approval, they shall label these items as guiding samples so that further works are executed to conform to these samples.

6.96 **TEST CERTIFICATES**

The contractor shall submit copy of test certificates for all the major electrical equipment such as circuit breakers, CTs, PTs, instruments, relays, busducts, rising mains, busbars, cables etc., and panel as a whole, confirming to relevant IS/BIS standards issued by manufacturers.

6.97 **SAMPLES AND CATALOGUES**

Before ordering the material necessary for these installations, the contractor shall submit to the Engineer-in-Charge/Consultants for approval, a sample of every kind of material such as cables, conductors, conduits, switches, socket outlets, circuit breakers, lighting fixtures, boxes etc., along with the catalogues with their dimensional details.
For major items such as sub lighting panels distribution boards, the submission of drawings/catalogues along with technical details shall be enough. Prior to ordering any electrical equipment/material/system, the contractor shall submit to the Engineer-in-Charge/Consultants the catalogues, along with the samples, where applicable, from the approved manufacturer. The contractor shall arrange inspection and testing at the manufacturer's factory or assembly shop for final approval. No material shall be procured prior to the approval of the Engineer-in- Charge/Consultant.

Also, the contractor shall ensure that the dimensional details of the equipment fit into the allotted space provided in the building.

6.98 **COMPLETION CERTIFICATE**

On completion of the electrical installation a certificate shall be furnished by the contractor countersigned by the licensed supervisor, under whose direct supervision the installation was carried out.

6.99 **PERFORMANCE GUARANTEE**

The contractor shall indemnify the Institute against defective materials and workmanship for a period of one year after completion of the work. The contractor shall also hold himself fully responsible during that period for reinstallation or replacement at free of cost to institute, the following:
Any defective work or material supplied by the Contractor.

Any material or equipment damaged or destroyed as a result of defective workmanship by the contractor.

6.100 **RATE ANALYSIS**

At any time and at the request of the Project Engineer the contractor shall provide details or breakdown of costs and prices of any part or parts of the works.

6.101 The Project Engineer cum estate officer of IISc reserves the rights to delete any item from the contractor’s scope of work.

## 6 CONTRACTOR'S LABOUR REGULATIONS

### 7.1 DEFINITION:

In these regulations unless otherwise, expressed or indicated the following words and expressions shall have the meaning hereby assigned respectively that is to say:

Labour means workers employed by the contractor or the Institute directly or indirectly through sub-contractor or any other person, or any agent on his behalf on a payment as per prevailing Karnataka State labour regulations and will not include supervisory staff like overseers etc.

Fair wages means whether for item or place of work notified at the time of inviting tenders for the work and where such wages have not been so notified, the wages prescribed by the Karnataka Public Works Department for the district in which the work is done.

Contractors shall include every person whether a sub-contractor head or agent employing labour on the work taken contract.

The relevant orders of Government of Karnataka in regard to payment of wages as amended from time to time shall be followed by the contractor.

### 7.2 WORKING HOURS:

Normally working hours of a labour employed should not exceed 8 hours a day. The working day shall be so arranged that inclusive of interval for rest if any, it shall not spread over more than 12 hours on any day.

When a worker is made to work for more than 8 hours on a day or for more than 48 hours in any week, he is entitled to double the ordinary rate of wages. Children shall not be made to work.

Every worker shall be given a paid weekly holiday normally on Sunday.

### 7.3 DISPLAY OF NOTICE REGARDING WAGES ETC.

The contractor shall (a) before he commences his work on contract, display and correctly maintain in a clean legible condition in conspicuous places on the work, notices in English and in the local language spoken by the majority of the workers, giving the rate of wages which have been certified by the Regional Labour Commissioner, as fair wages and the hours of work which such wages are earned, and a copy of such notices shall be sent to the certifying officers.

### 7.4 PAYMENT OF WAGES:

Wages due to every worker shall be paid to him direct.

### 7.5 FIXATION OF WAGES PERIODS:

The contractor shall fix the wages period of which the wages shall be payable.
Wages of every worker employed on the contract shall be paid.

In case of establishments in which the wage period is one week, within three days from the end of the wage period wages shall be paid. In the case of other establishment before the expiry of the 7th day or 10th day from the end of the wage period according to the numbers of the workers employed in such establishment does not exceed 100 or exceeds 1000.

When the employment of any workers is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the days succeeding the one which his employment is terminated.
All payment of wages shall be made on a working day except when the work is completed before the expiry of the wages period in which case final payment shall be made within 48 hours of the last working day at work site and during the time.
NOTE: The term working day means a day on which the labour is employed, and the work is in progress.

**7.6 FINE AND DEDUCTIONS WHICH MAY BE MADE FROM WAGES:**
The Wages of workers shall be paid to him without any deductions of any kind except the following deductions:
Deductions for absence for duty i.e., from the place or the places whereby the terms of his employment he is required to work. The amount of deductions shall be in proportion to the period for which he was absent.

Deductions for damage or loss of goods expressly entrusted to the employed person for custody or for loss of money or any other deduction which he is required to account, where such damage or loss is directly attributable to neglect or default.

Deduction for recovery of advance or for adjustment of over payment of wages, advance granted shall be entered in a register.

And other deductions which the Institute may from time to time allow.

**7.7 Fine:**

No fine shall be imposed on any worker save in respect of such acts and the Commissioner of Labour has approved omissions on his part as.

No fine shall be imposed on a worker and no deduction for damage or loss be made from his wages until the worker has been given an opportunity. Undertaking of showing cause against such fines or deductions.

The total amount of fines which may be imposed in any one wage period on a worker shall not exceed an amount equal to the wages payable to him in respect of that wage period.

No fine imposed on any worker shall be recovered from him by instalments or after the expiry of sixty days from the date which it was imposed.

Every fine shall be deemed to have imposed on a day of the act or omission in respect of which it was imposed.

The contractor shall issue an employment card in Form III to each worker on the day of the worker's entry into the employment. If the worker has already any such card with him for the previous employment of contractor, he shall merely endorse that employment card with relevant entries. On termination of employment, the employment card shall again be endorsed by the contractor and returned to the worker.

**7.8 REGISTER OF UNPAID WAGES**:
The contractor should maintain a register of unpaid wages in such a form as may be convenient at the place of work but same shall include the following particulars:

- Full particulars of the labourer's whose wages have not been paid.
- Reference number of the muster roll and wage register
- Rate of wages
- The period
- Total amount not paid
- Reasons for not making payment

- How the amount of unpaid wages was utilized
- Acquaintance with dates.

**7.9 REGISTER OF ACCIDENTS:**

The contractor shall maintain a register of accidents in such form as may be convenient at the workplace but the same shall include the following particulars.

- Full particulars of the laborers who met with accidents.
- Rate of wages
- Sex
- Age
- Nature of accidents and cause of accident
- Time and date of accidents
- Date and time when admitted in Hospital
- Date of discharge from the Hospital.

**The agency shall alone be liable to pay compensation for any damage/death /injury sustained by the personnel or any other members of the agency in the course of their work/duty at the Institute during the contract period. Govt. of India issued guidelines on payment of compensation in cases of death / permanent incapacitation of person due to unintended/ unforeseen occurrences during maintenance, operation and provisioning of public services. Under these guidelines, the agency has to pay an amount of Rs. 10 Lakhs as compensation in the cases where a person is died and up to Rs. 7.5 Lakhs in the case of disabled based on loss of earning capacity. Institute has the right to recover further penalty in the cases where the incidents have happened with the negligence of the agency.**

**7.10 REGISTER OF FINE ETC.**

The contractor shall maintain a register of fines and a register of deductions for damages or loss in form Nos. I and II respectively which shall be kept at the place of work.
The contractor shall maintain both in English and local language a list approved by Commissioner for labour clearly stating the acts and commissions for which penalty or fine may be imposed on a workman and display it in a good condition in conspicuous place on the work.

**7.11 SUBMISSION OF RETURNS:**

The contractor shall submit periodical returns as may be specified from time to time.

**7.12 AMENDMENTS**:

The Government of Karnataka may from time to time add to or amend the regulations and on may question as to the application interpretation on effect if these regulations the decision of the Commissioner of Labour or Deputy Commissioner for Labour to Govt. in that behalf shall be final.

**7.13 Labour Clause**

No labourers below the age of 18 years shall be employed on the work.
Payments of wages of labourers. The contractor shall pay not less than fair wage of labourers engaged by him on the work.

**EXPLANATION:**

(a) The contractor shall notwithstanding the provision of any contract to the contrary cause to be paid wages to labourers indirectly engaged for the work including any labour engaged by his sub-contractors in connection with the same works if the labourers have been immediately employed by him.
(b) In respect of all labours directly or indirectly employed in the works for the performance of the contractor's part of this agreement, the contractor shall comply with or cause to be complied with Govt. of India, Contractors Labour Regulations from time to time, in regard to payment of wages. Wage period, deductions from wages recovery of wages not paid and deductions unauthorized made, maintenance of wage book, wage slips, publication of scale of wage and other terms of employment, inspection and submission of periodical returns and all other matter of a like nature. The Project Engineer cum Estate officer or In-charge Engineer concerned shall have the right to deduct from the money due to the contractors any sum 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 her wages which are not justified by their terms of the contractor non-observance of the regulations.
(c) For payment of minimum wages, the Contractor is bound to follow the relevant orders of Govt. of India from time to time.
(d) Vis-à-vis the Institute the contractor shall be primarily liable for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim indemnity from his sub-contractors. The regulations aforesaid shall be deemed to be part of this contract, and any breach thereof shall be deemed to be a breach of this.

**7.14** In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this agreements the contractor shall at his own expense arrange for the safety provisions as per Karnataka P.W.D. safety code framed from time to time and shall at his own expense provide for all facilities in arrangements and provide necessary facilities as aforesaid he shall be liable to pay penalty of Rs.50/- for each default and in addition the Project Engineer cum Estate officer in charge shall be at liberty to make arrangements and provide facilities as aforesaid, and recover the cost incurred in that behalf from the contractor.

**7.15** The contractor shall submit by the 4th and 19th of every month to the Project Engineer of true statement showing in respect of the second half of the preceding month and the first half of the current month respectively (1) the name of labourers employed by him on the work (2) their working hours, (3) the wages paid to them, (4) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused to them and (5) the number of female workers who have been allowed, maternity benefit according to clause 19F and the amount paid to them, failing which the contractor shall be liable to pay the Institute a sum of not exceeding Rs. 50/- for each default or materially incorrect statement by deduction from any bill due to the contractor and amount levied as fine.

**7.16** In respect of all labour directly or indirectly employed in the works for the performance of the contractor's part of this agreement, the contractor shall comply with or cause to be complied with all the rules framed by Institute from time to time for the protection of health and sanitary arrangements for workers employed by the Indian Institute of Science and its contractors.
**7.17** Maternity benefit rules for female workers employed by contractor, leave and pay during leave shall be regulated as follows:

(i) in case of delivery: Leave during maternity leave not exceeding 8 weeks up to and including the day of delivery and 4 weeks following that day.

(ii)In case of miscarriage, up to 3 weeks from the date of miscarriage.

**7.18 Pay:**

i) In case of delivery: Leave pay during maternity leave will be at the rate of women's average daily earning calculated on the total wages earned on the days when full time work was done during the period of three months immediately preceding the date on which she gives notice that she expects to be confined.
ii) In case of miscarriages: Leave pay at the rate of average daily earnings calculated on the total wages earned on the day's full time works was due during a period of 3 months immediately preceding the date of miscarriage.

iii) Conditions for the grant of maternity leave: No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period of not less than 10 Months immediately preceding the date of delivery /miscarriage.

## 7 CONDITIONS OF CONTRACT

**Clause 1. <u>Security Deposit</u>**

| Estimated cost of the work put to tender | E.M.D Percentage | S.D. Percentage |
|---|---|---|
| (i) | (ii) | (iii) |
| Rs.5,17,21,488.00 | 1.5% | 6% |
| Note : EMD + SD to be limited to 7.5% of the contract value | | |

**(a) Clause -1(a)** The person/persons whose tender may be accepted (hereinafter called the contractor which expression shall unless the context otherwise requires, include his heirs, executors, administrators and assigns) shall pay Earnest Money Deposit indicated in Column (ii) of the table given below and shall permit Institute (a) to deduct SD at the percentage mentioned in Column (iii) of the table given below of all moneys payable of work done under the Contract, at the time of making such payments to him/them and (b) to hold such deductions as further Security Deposit. The EMD + SD will be limited to 7.5% of the contract value.

E.M.D - Earnest Money Deposit
S.D - Security Deposit

**No Interest will be paid on EMD / Further / Additional Security deposit.**

**(b) Additional or Reduction in Security Deposit**

The EMD for the tendered work and additional amount of Security Deposit at the rates mentioned in **Sub-clause 1(a)** above should be, paid by the contractor. The Project Engineer cum Estate officer may allow if a portion of the work is withdrawn from the Contractor under the provisions of Clause 12(a) a proportionate reduction in the amount of security Deposit.

***a) EMD paid along with the tender shall be refunded only after the completion of the defect liability period or payment of final bill whichever is later without any interest.***

***b) 1% labour cess towards workers Welfare Fund on the works expenditure will be recovered from RA bills for depositing the same to the welfare board as per Karnataka Govt. Order. Rates quoted should be inclusive of cess.***

**(c)** However, if the Contractor desires, agency may furnish a BG issued by the Public Sector Undertaking Bank / Scheduled commercial Bank / Nationalized Bank in favour of the Registrar, Indian Institute of Science, payable at Bangalore amounting to **5.5%** of the total contract value valid up to completion of defect liability period in which case EMD deposited by them will be refunded and no recoveries towards security deposit will be effected in the running account bills.

**(d) Dues to Institute, to be set off against Security Deposit.**

All compensation or other sums of money payable by the Contractor to Institute under the terms of this contract may be realized or deducted from any Security Deposit payable to him or from any sums which may be due or may become due by Institute to the Contractor on any account whatsoever and in the event of his security deposit being reduced by reason of any such realization or deduction as aforesaid, the Contractor shall, within ten days thereafter, make good in cash any sum or sums which have been deducted from his security deposit or any part thereof. Otherwise, the amount will be treated as outstanding due from the agency.

**(e) Refund of Security Deposit (EMD & SD):**

**i)** EMD paid by the contractor at the time of tendering and SD deducted from the R.A bills at the prescribed rates shall be refunded to the contractor immediately after the virtual

completion of the work against production of bank guarantee for an equal amount from any of the Scheduled commercial Bank/Nationalized Bank valid for a period as mentioned in clause (ii) below.

**ii)** The bank guarantee received as stipulated in (i) above, will be treated as performance guarantee and shall be returned to the contractor after the final bill is paid or after **Twenty Four Months including monsoon period** from the date of virtual completion of the work during which period the work should be maintained by the contractor in good order, whichever is later. The validity of the bank guarantee shall be maintained for the above period.

**iii)** In case of BG's furnished towards security deposit same shall be returned after completion of the defect liability period.

**Clause 2. PENALTY FOR DELAY**

**a) Written Order to Commence Work**

After acceptance of the tender, the Project Engineer cum Estate officer shall issue a written order to the successful Tenderer to commence the work. The Contractor shall enter upon or commence any portion of work only with the written authority and instructions of the Project Engineer cum Estate officer. Without such instructions the Contractor shall have no claim to demand for measurements of or payment for, work done by him.

**b) Programme of work**

The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor. It shall be reckoned from the date of handing over the site to the Contractor not less than 75 percent of work site area comprising a continuous block. The work shall throughout the stipulated period of the contract be proceeded with, all due diligence (time being deemed to be the essence of the contract on the part of the Contractor). To ensure good progress during the execution of the work, the contractor shall be bound (in all cases in which the time allowed for any work exceeds one month) to comply with the time schedule according to the programme of execution of the work as agreed upon and enclosed by the contractor during execution of agreement.

**c) Review of progress and responsibility for delay etc.,**

The Project Engineer cum Estate officer shall review the progress of all works with the contractor at least once every month. Such a review shall take into account the programme fixed for the previous week, obligations on the part of the Institute for issue of drawings etc, and also the obligations on the part of the Contractor. The review shall also examine the accumulated delays by the contractor if any and mitigation measures proposed by the contractor to overcome the delay.

**Apportioning of responsibility for delay between Contractor and Institute.**

In case the progress achieved falls short by more than 25 percent of the cumulative programme, the reasons for such shortfall shall be examined and a record made thereof apportioning the responsibilities for the delay between the contractor and the Institute. This record should be signed in full and dated both by the Project Engineer cum Estate officer and the Contractor. If the contractor refuses to sign the said record, approval of the reasons for delay may be submitted to **CENTER FOR CAMPUS MANAGEMENT AND DEVELOPMENT (CCMD)** for approval and such approval is binding on the contractor.

**Shortfall in progress made up subsequently.**

To the extent the shortfall is assessed, as due to the delay on the part of the contractor, a notice shall be issued to him by the Project Engineer cum Estate officer to make up the shortfall. If the shortfall is not made up before the progress of the work is reviewed during the second month succeeding the month in which the shortfall was observed, the Contractor shall be liable to pay penalty as indicated in **Clause 2(d)** below.

**Grant of extension of time.**

If the delay is attributable to reasons beyond the control of the Contractor, requisite extension of time shall be granted by the Project Engineer cum Estate officer in accordance with **Clause 5** after obtaining the approval of his higher authorities, wherever necessary.

**Review of progress by Centre for Campus Management and Development.**

The Centre for Campus Management and Development shall review the progress periodically, preferably more number of times as required. These reviews are in addition to the monthly reviews required to be done by the Project Engineer cum Estate officer. The results of such review by the CENTER FOR CAMPUS MANAGEMENT AND DEVELOPMENT (CCMD) shall, wherever necessary, be incorporated in the next review of the Project Engineer cum Estate officer.

If the Contractor stops the work for 45 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Employer, then The Employer may terminate the Contract at the risk and cost of the contractor.

**Settlement of dispute regarding shortfall in progress.**

In case of dispute between the Project Engineer cum Estate officer and Contractor regarding the responsibility for the shortfall in progress, the matter shall be referred to the Centre for Campus Management and Development who shall thereupon give a decision within fifteen days from the date of receipt of reference. The decision of the Centre for campus management and Development shall be final and binding on the contractor and the Project Engineer cum Estate officer.

**d) Penalty for delay**

In respect of the shortfall in progress, assessed as due to the delay on the part of contractor as per **Clause 2(b)** and **2 (c)**, the contractor shall be liable to pay as penalty an amount equal to one percent of the contract value of the balance work assessed according to the programme(Clause 35), for every week that the due quantity of work remains incomplete; provided always that the total amount of penalty to be paid under the provisions of this clause subjected to a maximum of 10 percent of the contract value of the entire work as shown in the tender, provided further that in the event of the contractor making up the shortfall in progress within the stipulated or extended time of completion, the penalty so recovered may be refunded on an application in writing by the contractor.

**Note:** If the Project Engineer cum Estate officer considers it necessary, he shall be entitled to take action as indicated in **Clause 3 (d)** also.

**d.(1). Liquidated damages**

The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the Contract Data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

If the Intended Completion Date is extended after liquidated damages have been paid, the Employer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment of bill.

**(e) Adjustment of excess/over payments.**

Excess/over payments as soon as they are discovered should be adjusted in the next running account bill of the contractor and in case the final bill has already been paid, the excess/over payment made shall be recovered from the Security Deposit of the contractor together with interest at such percentages as Institute may decide from time to time, from the date of such excess or over payment to the date of recovery.

**ACTION WHEN WHOLE OF SECURITY DEPOSIT IS FORFEITED**

**Clause 3**. In any case in which under any clause or clauses of this contract the contractor shall have rendered himself liable to pay compensation and/or penalty amounting to the whole of his security deposit including the amount deducted in instalment from his bills as Further Security Deposit, the Project Engineer cum Estate officer on behalf of the Director, IISc shall have power to adopt any of the following courses as he may deem best suited in the interest of Institute.

**(a) Forfeiture of Security Deposit.**

Without prejudice to Institute's right to recover any loss from the Contractor under sub-clauses (b) and (c) of Clause 3 of the Contract, to rescind the contract (of which rescission notice in writing to the contractor under the hand of the Project Engineer cum Estate officer shall be conclusive evidence). And in that case, the security deposit of the contractor including whole or part of the lump sum deposited by him and also the amount deducted from his bills as Further Security Deposit, shall stand forfeited and be absolutely at the disposal of the Institute.

**(b) Debiting cost of labour and materials supplied.**

To employ labour paid by the Institute and to supply materials to carry out the work or any part of the work, debiting the contractor with the cost of the labour and the price of the materials (as to the correctness of which cost and price the certificate of the Project Engineer cum Estate officer shall be final and conclusive against the contractor) and crediting him with the value of the work done; in all respects in the same manner and at the same rates as if it had been carried out by the contractor under terms of this contract, and in that case the certificate of the Project Engineer cum Estate officer as to the value of the work done shall be final and conclusive against the contractor.

**(c) Recovery of extra cost on unexecuted work**

To measure up the work of the contractor and to take such part thereof as is remaining unexecuted out of his hands and to give it to another contractor to complete it in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (as to the amount of which excess expenses the certificate in writing of the Project Engineer cum Estate officer shall be final and conclusive) shall be borne and paid by the original contractor and shall be deducted from any money due to him by Institute Otherwise the amount will be treated as outstanding due from the agency.

**(d) Action against unsatisfactory progress**

If the contractor does not maintain the rate of progress as required under **Clause 2** and if the progress of any particular portion of work is unsatisfactory even after taking action under **Clause 2(c)** and **2(d)**, the Project Engineer cum Estate officer shall be entitled to take action under **Clause 3(b)** or **3(c)** at his discretion in order to maintain the rate of progress after giving the contractor 10 days notice in writing whereupon the contractor will have no claim for any loss sustained by him owing to such actions.

**(e) No compensation for loss sustained on advance action**

In the event of any of the above courses being adopted by the Project Engineer cum Estate officer, the contractor shall have no claim to compensation for any loss sustained by him

by reason of his having purchased, or procured any materials, entered into any agreements or made any advances on account of, or with a view to the execution of the work or the performance of the contract. And in case the contract shall be rescinded under the provision aforesaid the contractor shall not be entitled to recover or be paid any sum for any work thereof actually performed by him under his contract, unless and until the Project Engineer cum Estate officer shall have certified in writing the performance of such work and the amount payable in respect thereof, and he shall only be entitled to be paid the amount so certified.

(f) Recovery of 1% of the contract value towards the laborers welfare fund created by the Government of Karnataka will be effected in the running account bills of the contractor.

**Clause 4. <u>CONTRACTOR TO REMAIN LIABLE TO PAY COMPENSATION IF ACTION IS NOT TAKEN UNDER CLAUSE-3</u>.**

In any case in which any of the powers conferred upon the Project Engineer cum Estate officer by **Clause 3** thereof shall have become exercisable and the same shall not have been exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor for which under any clause hereof he is declared liable to pay compensation or penalty amounting to the whole of his security deposit and the liability of the contractor for past and future compensation or penalty shall remain unaffected.

**Power to take possession of or require removal of or sell contractor's properties.**

In the event of the Project Engineer cum Estate officer taking action under **sub-clause (a)** or **(c) of Clause 3**, he may, if he so desires, take possession of all or any tools, plant, materials and stores, in or upon works or the site thereof or belonging to the contractor, or procured by him and intended to be used for the execution of the work or any part thereof, paying or allowing for the same in account at the contract rates; or in the case of contract rates not being applicable, at current market rates, to be certified by the Project Engineer cum Estate officer whose certificate thereof shall be final. In the alternative, the Project Engineer cum Estate officer may after giving notice in writing to the contractor or his clerk of the works, foreman or other authorised agent, require him to remove such tools, plant, materials or stores from the premises within a time to be specified in such notice; and in the event of the contractor, failing to comply with any such requisition, the Project Engineer cum Estate officer may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respect, and the certificate of the Project Engineer cum Estate officer as to the expense of any such removal; and the amount of the proceeds and expense of any such sale shall be final and conclusive against the contractor.

**Clause 5. <u>GRANT OF EXTENSION OF TIME</u>**

**(a)** If the contractor shall desire an extension of the time for completion of the work, he shall apply in writing to the Project Engineer cum Estate officer before the expiry of the period stipulated in the tender or before the expiry of 30 days from the date on which he was hindered as aforesaid or on which the cause for asking for extension occurred, whichever is earlier and the Project Engineer cum Estate officer or other competent authority may if in his opinion, there are reasonable grounds for granting an extension, grant such extension as he thinks necessary or proper. The decision of such competent authority in this matter shall be final.

**(b)** The time limit for completion of the work shall be extended commensurate with its increase in cost occasioned by alterations or additions and the certificate of the Project Engineer cum Estate officer or other competent authority as to such proportion shall be conclusive.

**Clause 6. <u>ISSUE OF FINAL CERTIFICATE</u> – CONDITIONS REGARDING**

On completion of the work the contractor shall report in writing to the Project Engineer cum Estate officer the completion of the work. Then he shall be furnished with a certificate by the Project Engineer cum Estate officer of such completion, but no such certificate shall be given nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall have been executed, all scaffolding, surplus materials and rubbish, and shall have cleaned thoroughly all wood work, doors, windows, wall, floor or other parts of any building, in or upon which the work has been executed, or of which he may have had possession for the purpose of executing the work, nor until the works shall have been measured by the Project Engineer cum Estate officer or other competent authority, or where the measurements have been taken by his Project Engineer until they have received the approval of the Project Engineer cum Estate officer or other competent authority, the said measurements being binding and conclusive against the contractor. If the contractor shall fail to comply with the requirements of this clause as to the removal of scaffolding, surplus materials and rubbish, and cleaning on or before the date fixed for the completion of the work the Project Engineer cum Estate officer or other competent authority may, at the expense of the contractor, remove such scaffolding, surplus materials and rubbish, and dispose of the same as he think fit and clean off such dirt etc., as aforesaid and contractor shall be liable to pay the amount of all expenses incurred but shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

**Note: CLOSURE OF CONTRACT PENDING COMPLETION OF MINOR ITEMS.**

In cases where it is not desirable to keep the building contract open for minor items, such as flooring in the bathrooms, etc., which can be carried out only after installation of sanitary work the main contract may be finalized after getting a supplementary agreement executed in the prescribed form by the same contractor for doing the residual work.

**Clause 7. Contractor to submit bills monthly in printed form**

(a) A bill shall be submitted by the contractor on or before 15th of each month for all items of work executed in the previous month as required by IISc. The Running account bills will be paid within three weeks from the date of submission of the bill in complete acceptable form after duly checked and certified by concerned Engineer, under normal circumstances.

All bills shall be prepared in the prescribed printed and electronic form in PDF/Excel format in quadruplicate and handed over to the Project Engineer in charge of the work/ Project Engineer cum Estate officer's Office and acknowledgment obtained.
The charges to be made in the bills shall always be entered at the rates specified in the tender in full or in part as the case may be, in the case of any extra work ordered in pursuance of these conditions, and not mentioned or provided for in the tender, the charges in the bills shall be entered at the rates hereinafter provided for such work.

**(b) Scrutiny of Bills and measurement of work**
The details furnished by the Contractor in the bill will be completely scrutinized and the said work will be measured by the Project Engineer in the presence of the Contractor or his duly authorized agent. The countersignature of the contractor or the said agent in the measurement book shall be sufficient proof to the correctness of the measurements, along with the Test certificates to be produced with the bill, which shall be binding on the contractor in all respects.
**(c)** One copy of the passed bill shall be given to the Contractor without any charge.

**Clause 8. PAYMENT PROPORTIONATE TO WORK APPROVED AND PASSED.**

No payment shall be made for any work estimated to cost rupees five thousand or less until after the whole of the work shall have been completed and certificates of completion given. But in the case of works estimated to cost more than Rs. 5,000 the contractor shall on

submitting the bill and after due verification by the Project Engineer as per Clause 7(b) entitled to necessary Payment proportionate to the part of the work then approved and passed by the Project Engineer cum Estate officer or other competent authority whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the contractor i.e. part payment of submitted RA bills is admissible to contractor. Any such reduced payment amount is admissible for adjustment in the successive RA Bills or Final Bill.

**Payment at reduced rates**
The rates for several items of works agreed to within shall be valid only when the items concerned are accepted as having been completed fully in accordance with the stipulated specifications. In cases where the items of work are not accepted as so completed, The Project Engineer cum Estate officer or other competent authority may make payment on account of such items at such reduced rates as he may consider reasonable in the preparation of final or on account bills.

**Payment or intermediate certificates be regarded as advances:**
All such intermediate payments shall be regarded as payments by way of advance against the final payments only and not as payments for work actually done and completed, and shall not preclude the Project Engineer cum Estate officer or other competent authority from requiring any bad, unsound imperfect or unskilful work to be removed or taken away and reconstructed or re-erected nor shall any such payment be considered as an admission for the due performance of the Contract or any part thereof in any respect or the accruing of any claim, nor shall it conclude determine or affect in any other way the powers of the Project Engineer cum Estate officer or other competent authority as to the final settlement and adjustment of the accounts, or otherwise or in any other way vary or affect the contract.

**Submission of Final bill and its settlement**
The contractor shall submit the final bill within one month from the date of actual completion of the work in all respects. His claims shall be settled within five months from the date of submission of the bill in complete acceptable form after duly checked and certified by concerned Engineer, under normal circumstances.

**Disputed items**
Note: The contractor shall submit a list of the disputed items within 30 days from the disallowance thereof and if he fails to do this, his claim shall be deemed to have been fully waived and absolutely extinguished.

**Clause 9. Definition of Work :**

a. The expression `Work' or 'Works' where used in these conditions, shall unless there be something in the subject or context repugnant to such construction, be construed to mean the work or works contracted to be executed under or in virtue of the contract, whether temporary or permanent and whether original, altered, substituted or additional.

**b. Work to be executed in accordance with specifications, drawings, orders etc.**

The contractor shall execute the whole and every part of the work in the most sound and substantial and workmanlike manner, and in strict accordance with the specifications both as regards materials and workmanship. The contractor shall also conform exactly, fully and faithfully to the designs, drawings and instructions in writing relating to the work signed by the Project Engineer cum Estate officer or other competent authority and lodged in his office and to which the contractor shall be entitled to have access at such office, or on the site of the work for the purpose of inspection during office hours. The contractor shall also be responsible for the delivery of structure in sound conditions and the execution of the work strictly in accordance with the specifications of the work.

**c. Action where there is no specification**

In the case of any class of work for which there is no such specification, then in such a case of the work shall be carried out in all respects in accordance with the instructions and requirements of the Project Engineer cum Estate officer or other competent authority.

**d. Work as per Specifications and IS Codes.**

The detailed specification, which forms a part of contract, accompanies the tender document. In carrying out the various items of work as described in Schedule B of the tender documents and the additional, substituted, altered items of work, this detailed specification shall be strictly adhered to, supplemented by relevant provisions of Indian standard specifications, the code of practice; etc., The Indian standard specification, National Building Code and the code of practice to be followed shall be the latest versions of those listed in the detailed technical specifications. Any class of work, not covered by the detailed technical specifications, shall be executed in accordance with the instructions and requirements of the Project Engineer cum Estate officer and the relevant provisions of the Indian standard specifications.

**Clause 10. Alteration in quantity of work, specifications and designs, Additional work, deletion of work**

The Project Engineer cum Estate officer shall have power to make any alternations in, omissions from additions to or substitutions for the original specification, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work. For that purpose or if for any other reason it shall in his opinion be desirable, he shall have power to order the Contractor to do and the contractor shall do any or all the following: -

a) Increase or decrease the quantity of any work included in the contract.
b) Omit any such work.
c) Change the character or quality or kind of any such work,
d) Change the levels, lines, positions and dimensions of any part of the work,
e) Execute additional work of any kind necessary for the completion of the works and
f) change in any specified sequence, methods or timing of construction of any part of the work.

**Contractor bound by Project Engineer cum Estate officer's instructions**

The Contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing signed by the Project Engineer cum Estate officer or other competent authority and such alteration shall not in any way vitiate or invalidate the contract.

**Standard Quantity Take-off (SQT)**

Contractor within **14 days** of Issue of LOI to submit the Project Manager & seek approval for the Standard quantity Take-off sheets for all the items mentioned in the Tender BOQ, after due referencing the Tender/ GFC drawings and the Technical Specification. Upon approval, the SQT shall remain the base document for initiating any change orders/ variation in accordance to Clause 31, tracking the daily project progress, and for the measurement sheets.

**Orders for variations to be in writing**

**1.** No such variations shall be made by the Contractor without an order in writing of the Project Engineer cum Estate officer; provided that no order in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is the result of the quantities exceeding or being less than those stated in the 'Schedule B' provided also that if for any reason the Project Engineer cum Estate officer shall consider it desirable to give any such order verbally, the Contractor shall comply with such order

without any confirmation in writing of such verbal order given by the Project Engineer cum Estate officer, whether before or after the carrying out of the order, shall be deemed to be an order in writing within the meaning of the clause; provided further that if the Contractor shall within seven days confirm in writing to the Project Engineer cum Estate officer and if such confirmation is not contradicted in writing within fourteen days by the Project Engineer cum Estate officer, it shall be deemed to be an order in writing by the Project Engineer cum Estate officer.

**2.** **a)** Any additional work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on same conditions in all respects on which he agreed to do the main work and same rates as are specified in the tender for the main work. However, change in the Undertaking rates tendered and accepted shall be considered in respect of items under which the quantity of work performed exceeds tendered quantity by more than 25 percent and this actual change in rate will be restricted only to such excess quantity (i.e. beyond 125 percent of the tendered quantity).

**(b) Rate for excess quantity beyond 125 percent of tendered quantity**

The Additional quantity which exceeds 125 percent of the tendered quantity shall be paid at the rates entered in or derived from Schedule of Rates prevalent at the time of executing additions and alterations plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates (KPWD) of the year in which the tender is accepted (as per the comparative Statement prepared at the time of acceptance of the tender).

**(c) Rates for additional, substituted, altered items of work**

If the additional, substituted or altered work includes any class of work for which no rate is specified in the contract, then such work shall be carried out at the rates specified for or derived from similar item of work in the agreement. In the absence of similar items in agreement, rate shall be as specified for or derived from similar items in the schedule of rates of KPWD prevalent at the time of execution of such additional substituted or altered items of works, plus or minus the overall percentage of original tendered rates over the current schedule of rates of (KPWD) the year in which tender is accepted as mentioned in sub clause (b) above. With regard to the question whether the additional, substituted or altered item/items of work/works is / are similar or not, to that/those in the agreement / in the Schedule of Rates of KPWD and the decision of the CCMD shall be final and binding on the contractor.

**(d) Determination of rates for items not found in Estimate or Schedule of Rates**

If the rates for additional, substituted or altered work cannot be determined in the manner specified in sub **clauses (b)** and **(c)** above, then the contractor shall within 7 days of the date of receipt by him of the order to carry out the work, inform the Project Engineer cum Estate officer of the rates which it is his intention to charge for such class or work, supported by analysis of the rate or rates claimed. Thereupon the Project Engineer cum Estate officer shall determine the rate or rates on the basis of observed data and failing this, on the basis of prevailing market rates. Under no circumstances the contractor shall suspend the work on the plea of non- settlement of rates for items falling under this clause. In the event of any dispute regarding the rates for such items the decision of Project Engineer cum Estate Officer, CCMD shall be final.

Working out the data rates for non-SR/ non tendered items shall be based on the procedures laid down in the standard rate analysis format of KPWD Bangalore circle Bangalore. The data rates shall be approved by the Project Engineer cum Estate Officer, CCMD and shall be binding on the contractor.

**Clause 11. <u>TIME LIMITS UNFORSEEN CLAIMS</u>**

Under no circumstances whatever shall the contractor be entitled to any compensation from Institute on any account unless the contractor shall have submitted claim in writing to the Project Engineer cum Estate officer or other competent authority within 30 days of the cause of such claim occurring.

**Clause 12. NO CLAIM TO ANY PAYMENT OR COMPENSATION FOR DELETION OF WHOLE OR PART OF WORK**

**(a)** If at any time after the execution of the contract documents, the Project Engineer cum Estate officer or other competent authority shall, for any reason whatsoever, require the whole or any part of the work as specified in the tender, to be stopped for any period or require the whole or part of the work (i) not to be carried out at all or (ii) not to be carried out by the tendered contractor, he shall give notice in writing of the fact to the contractor who will thereupon suspend or stop the work totally or partially as the case may be. In any such case, except as provided hereunder, the contractor 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 so derive in consequence of the full amount of the work not having been carried out, or on account of any loss that he may be put on account of materials purchased or agreed to be purchased, or for unemployment of labour recruited by him. He shall not also have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions, which may involve any curtailment of the work, as originally contemplated.

**(b) Payment for materials already purchased or ordered by contractor.**

Where, however, materials have already been purchased or agreed to be purchased by the contractor before receipt by him the said notice the contractor shall be paid for such materials, at the rates determined by the Project Engineer cum Estate officer or other competent authority provided they are not in excess of requirements and are of approved quality, and/or shall be compensated for the loss, if any, that he may be put to, in respect of materials agreed to be purchased by him, the amount of such compensation to be determined by the Project Engineer cum Estate officer or other competent authority whose decision shall be final.

**(c) Labour charges during stoppage of work**

If the contractor suffers any loss on account of his having to pay labour charges during the period during which the stoppage of work has been ordered under this clause, the contractor shall on application, be entitled to such compensation on account of labour charges as the Project Engineer cum Estate officer or other competent authority, whose decision shall be final, may consider reasonable. Provided that the contractor shall not be entitled to any compensation on account of labour charges if in the opinion of the Project Engineer cum Estate officer or other competent authority, the labour could have been employed in the same locality by the contractor for the whole or part of the period during which the stoppage of the work has been ordered as aforesaid.

**(d) Time limit for stoppage of work**

The period of stoppage ordered by the Project Engineer cum Estate officer or other competent authority should not ordinarily exceed six months. Thereafter the portion of works stopped may be treated as deleted from this agreement if a notice in writing to that effect is given to the Project Engineer cum Estate officer or other competent authority by the contractor within seven days after the expiry of the above period.

**Execution of work deleted:**

The portion of work thus deleted may be got executed from the same contractor on supplemental agreement on mutually agreed rates, which shall not exceed current Schedule of Rates plus or minus tender percentage.

**Clause 13. ACTION AND PENALTY IN CASE OF BAD WORK**

If at any time before the security deposit is refunded to the contractor, it shall appear to the Project Engineer cum Estate officer or other competent authority that any work has been executed with unsound, imperfect or unskilful workmanship or with materials of inferior quality, or that any materials or articles provided by him for the execution of the work are unsound or of a quality inferior to that contracted for, or are otherwise not in accordance with the contract, it shall be lawful for the Project Engineer cum Estate officer or other competent authority to intimate this fact in writing to the contractor and then notwithstanding the fact that the work, materials or articles complained of may have been paid for, the contractor shall be bound forthwith to rectify, or remove and reconstruct the work so specified on whole or in part as the case may require, or if, so required shall remove the materials or articles at his own charge and cost and in the event of his failing to do so within a period to be specified by the Project Engineer cum Estate officer or the competent authority in the written intimation aforesaid, the contractor shall be liable to pay a penalty not exceeding one percent on the amount of the estimate for every day not exceeding ten days during which the failure, so continues and in the case of any such failure the Project Engineer cum Estate officer or other competent authority may rectify or remove, and re-execute the work or remove and replace the materia1s or articles complained of, as the case may be at the risk and expense in all respects of the contractor should the Project Engineer cum Estate officer or other competent authority for any valid reasons consider that any such inferior work or materials as described above is to be accepted or made use of, it shall be within his discretion to accept the same at such reduced rates he may fix thereof.

**Clause 14. WORK TO BE OPEN TO INSPECTION - CONTRACTOR OR RESPONSIBLE AGENT TO BE PRESENT**

**(a)** All works under or in course of execution or executed in pursuance of the contract shall at all time be open to the inspection and supervision of the Project Engineer cum Estate officer or other competent authority and his Engineer-in-charge, and the contractor shall at all times during the usual working hours, and at all other times at which reasonable notice of the intention of the Project Engineer cum Estate officer or other competent authority Project Engineer to visit the work shall have been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing present for the purpose. Orders given to the contractor duly authorized agent shall be considered to have the same force and effect as if they had been given to the contractor himself.

**(b) Employment of Minimum Technical Staff**

The Contractor shall employ the following technical staff during execution of this work:

a) One qualified Graduate Engineer & One qualified Diploma Engineer, when the cost of the work to be executed up to 1 Crore,
b) Two qualified Graduate Engineer & Three qualified Diploma Engineer, when the cost of the work to be executed from 1 Crore to 10 crores;
c) Three qualified Graduate Engineer & Six qualified Diploma Engineer, when the cost of the work to be executed above 10 crores;
d) In addition to (i) and (ii) above, the contractor shall employ different types of such technical personnel as may be required and sufficient for execution of work and directed by the Project Engineer cum Estate officer to ensure efficient execution of work.
e) The technical staff so employed, should be available at site whenever required by Engineer in-charge to take instructions.

f) If the contractor fails to employ the technical staff as aforesaid, he shall be liable to pay a sum of Rs. 25000 (Rupees Twenty thousand only) for each month of default in the case of Graduate Engineers and Rs. 15000 (Rupees Ten thousand only) for each month of default in case of Diploma Holders.

g) If the Contractor himself possesses the required qualification and is available at the site for receiving instructions from the Project Engineer cum Estate officer and other competent authority vide **sub-clause (a**) above it will not be necessary for the technical staff to be available at site for receiving instructions.

**Clause 15. NOTICE TO BE GIVEN BEFORE WORK IS COVERED UP**

The contractor shall give not less than five days' notice in writing to the Project Engineer cum Estate officer or his Project Engineer in charge of the work before covering up or otherwise placing beyond the reach of the measurement any work in order that the same may be measured; and correct dimensions thereof taken before the same is so covered up or placed beyond the reach of measurement, and shall not cover up or place beyond the reach of measurement, and work without the consent in writing of the Project Engineer cum Estate officer or other competent authority or his Project Engineer in charge of work; and if any work shall be covered up or placed beyond the reach of measurement, without such notice having been given or consent obtained, the same shall be uncovered at the contractor's expense, and in default thereof no payment or allowance shall be made for such work or for the materials with which the same was executed.

**Clause 16. CONTRACTOR LIABLE FOR DAMAGE DONE, AND FOR IMPERFECTIONS FOR TWELVE MONTHS AFTER CERTIFICATE OF COMPLETION**

If the Contractor or his workmen or servants shall break, deface, injure or destroy any part of a building in which they may be working, or any building, road fence, enclosure or grassland or cultivated ground contiguous to the premises on which the work or any part thereof is being executed, or if any damage shall be done to the work, while it is in progress from any cause whatever or if any imperfections become apparent in it within Twelve months of the grant of a certificate of completion, final or otherwise, by the Project Engineer cum Estate officer or other competent authority the contractor shall make good the same at his own expenses, or in default the Project Engineer cum Estate officer or other competent authority may cause the same to be made good by other workmen, and deduct the expenses (of which the certificate of the Project Engineer cum Estate officer or other competent authority shall be final) from any sums that may be due or may thereafter become due to the contractor, or from his Security Deposit or the proceeds of sale thereof, or of a sufficient portion thereof.

The Defects liability period shall be extended for as long as defects remain to be corrected. Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Institute.

**Clause 17. CONTRACTOR TO SUPPLY PLANT, LADDERS, SCAFFOLDINGS, ETC., AND IS LIABLE FOR DAMAGES ARISING FROM NON-PROVISION OF LIGHT, FENCING ETC**

The contractor shall supply at his own cost all materials, plant, tools, appliance, implements, ladders, scaffolding, and temporary works required for the proper execution of the work whether in the original, altered or substituted form and whether included in the specification, or other documents forming part of the contract or referred to in these conditions or not, and which may be necessary for the purpose of satisfying or complying with the requirements of the Project Engineer cum Estate officer or other competent authority as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore, to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of setting out works, and counting,

weighing and assisting in the measurement or examination at any time and from time to time of the work or the materials. Failing this, the same may be provided by the Project Engineer cum Estate officer or other competent authority at the expense of the contractor and expense may be deducted from any money due to the contractor under the contract or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof. The contractor shall provide necessary fencing and lights required to protect the public from accident, and shall also be bound to bear the expense of defense of every suit, action or other legal proceedings, that maybe brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any suit, action or proceedings to any person, or which may with the consent of the contractor be paid for compromising any claim by any such person.

**Clause 18. Measures for prevention of fire**

The contractor shall not set fire to any standing jungle, trees, brushwood or grass without a written permit from the Project Engineer cum Estate officer. When such permission is given, and also in all cases when destroying cut or dug up trees, brushwood grass, etc., by fire the contractor shall take necessary measures to prevent such fire spreading to or otherwise damaging surrounding property.

**Clause 19. Liability of contractor for any damages done in or outside work Area.**

Compensation for all damages done by contractor or his men whether in or beyond the limits of Institute property including any damage caused by spreading of fire mentioned in Clause 18 shall be estimated by the Project Engineer cum Estate officer and the estimate of the Project Engineer cum Estate officer, subject to the decision of the Centre for Campus Management and Development on appeal shall be final and the contractor shall be bound to pay the amount of the assessed compensation on demand failing which the same will be recovered from the contractor as the damages in the manner prescribed in clause 1(c) or deducted by the Project Engineer cum Estate officer or other competent authority from any sums that may be due or become due from Institute to the contractor under this contract or otherwise.

The contractor shall bear the expenses of defending any action or other legal proceedings that may be brought by any person for injury sustained by him owing to neglect of precautions to prevent the spread of fire and shall pay any damages and cost that may be awarded by the court in consequence.

**Clause 20. Work on Notified Holiday**

No work shall be done on any notified holiday without the sanction in writing of the Project Engineer cum Estate officer or other competent authority.

**Clause 21. WORK NOT TO BE SUBLET**

**(a)** The contract shall not be assigned or sublet by the contractor. However, any specific portion of the work which is of a specialized nature and normally not executable by a general contractor could be got done by the specialized agencies which are executing such works, after obtaining the specific approval of the Project Engineer cum Estate officer in writing in each case. Such consent to sublet the work, if given, shall not relieve the contractor from any liability or obligation under the contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor or his agents, servants or workmate as fully as if they were the acts, defaults or neglects of the contractor, his agents, servants or workmen.

**Consequences of subletting work without approval, becoming insolvent, bribing etc., by contractor and action against the contractor.**

If the contractor shall assign or sublet his contract or any portion thereof without the specific approval of the Project Engineer cum Estate officer or attempts to do so or become insolvent or commence any proceedings to get himself adjudicated as insolvent or make any composition with his creditors or attempts so to do or if any bribe, gratuity, or indirectly be given, promised or offered by the contractor or any of his servants or agents to any officer or person in the employ of Institute in any way relating to his office or employment or if any such officer or person in the employment or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Project Engineer cum Estate officer or other competent authority may thereupon by notice in writing rescind the contract and the security deposit of the contractor shall thereupon stand forfeited and be absolutely at the disposal of Institute and the same consequences shall ensure as if the contract had been rescinded under Clause 3 here of and in addition, the contractor shall not be entitled to recover or be paid for any work actually performed under contract.

**(b) Recovery of excess payments based on excess measurements and action against contractor.**

Whenever it is noticed that excess payments have been made to the contractor based on excess measurements recorded by the Project Engineer in the measurement book and countersigned by the contractor or his duly authorized agent, action shall be taken to recover the excess payments together with interest immediately. Action may also be taken to remove the name of the contractor from the approved list of contractors and also to blacklist him.

**Change in classification of excavations accepted not permitted.**

Once the measurements mentioning the classification of the excavations are recorded in the measurement book and the same is signed by the contractor or his authorized agent in token of acceptance, no request for reclassification by the contractors shall be entrained.

**(c) Criminal proceedings against IISc Officer and Contractor for the lapses.**

Institute also reserve the right to initiate criminal proceedings against the concerned Institute Officers who are directly responsible for the lapse and the contractors who have colluded with the officers of the Institute in the lapse and fraudulently received amounts not due to them legitimately.

**Clause 22. <u>SUM PAYABLE BY WAY OF COMPENSATION TO BE CONSIDERED AS REASONABLE COMPENSATION WITHOUT REFERENCE TO ACTUAL LOSS.</u>**

All sums payable by a contractor by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied for the use of Institute without reference to the actual loss or damage sustained and whether any damage has or has not been sustained.

**Clause 23. <u>SETTLEMENT OF DISPUTES -TIME LIMIT FOR DECISION</u>**

**(a)** If any dispute or difference of any kind whatsoever were to arise between the Project Engineer cum Estate officer and the contractor regarding the following matters namely,

**(i)** The meaning of the specification's designs, drawing and instructions herein before mentioned,

**(ii)** The quality of workmanship or materials used on the work and

**(iii)** Any other question, claim right, matter, thing whatsoever, in any way arising out of or relating to the contract, designs, drawings, specification, estimates, instructions, or orders, or those conditions, failure to execute the same whether arising during the

progress of the work, or after the completion, termination or abandonment thereof, the dispute shall, in the first place, be referred to the Centre for campus management and Development who have jurisdiction over the work specified in the contract. The Centre for campus management and Development shall within a period of fifteen days from the date of being requested by the Contractor to do so give written notice of its decision to the Contractor.

If the decision of the Centre for campus management and Development is not acceptable to the contractor, he may approach the **Director, IISc within** a period of 15 days for settlement.

**(b) Director, IISc decision's final.**

Subject to other form of settlement hereafter provided, the Director's decision in respect of every dispute or difference so referred shall be final binding upon the contractor. The said decision shall forthwith be given effect to and contractor shall proceed with the execution of the work with all due diligence.

**(c) Remedy when Director's decision is not acceptable to contractor.**

In case the decision of the Director is not acceptable to the contractor, he may approach the Law Court at Bangalore for settlement of dispute after giving due written notice in this regard to the Director within a period of ninety days from the date of receipt of the written notice of the decision of the Director. Further, the Bangalore courts alone shall have the exclusive jurisdiction.

**(d) Time limit for notice to approach Court of law by contractor**

If the Director has given written notice of his decision to the contractor and no written notice to approach the law court has been communicated to him by the contractor within a period of ninety days from receipt of such notice, the said decision of Director shall be final and binding upon the contractor.

**(e) Time limit for notice to approach law court by contractor when decision is not given by Director, IISc as at (b).**

If the Director fails to give notice of his decision within a period of ninety days from the receipt of the contractor's request in writing for settlement of any dispute or difference as aforesaid, the Contractor may within ninety days after the expiry of the first named period of ninety days approach the Law Courts at Bangalore giving due notice to the Director.

**(f) Contractor to execute and complete work pending settlement of dispute.**

Whether the claim is referred to the Director or to the Law Courts, as the case may be, the contractor shall proceed to execute and complete the works with all due diligence pending settlement of the said dispute or differences.

**(g) Obligations of the Project Engineer cum Estate officer and contractor shall remain unsettled during considerations of dispute.**

The reference of any dispute or difference to the Director or the Law Court may proceed notwithstanding that the works shall then be or be alleged to be complete, provided always that the obligations of the Project Engineer cum Estate officer and the contractor shall not be altered by reason of the said dispute or difference being referred to the Director or the Law Court during the progress of the works.

**Clause 24. <u>CONTRACTOR TO PAY COMPENSATION UNDER WORKMEN'S COMPENSATION ACT.</u>**

**(a)** The contractor shall be responsible for and shall pay any compensation to his own workmen payable under the relevant Workmen's Compensation Act for injuries caused to the workmen. If Institute pays such compensation on behalf of the contractor it shall be recoverable by Institute from the contractor under as per relevant clauses.

**(b)** **Contractor to pay expenses of providing medical aid to workmen.**

The contractor shall be responsible for and shall pay the expenses of providing medical aid to any workman who may suffer a bodily injury as a result of an accident. If Institute incurs such expenses, the same shall be recoverable from the contractor forthwith and be deducted without prejudice to any other remedy of Institute, from any amount due or that may become due to the contractor.

**Clause 25. CONTRACTOR TO PROVIDE PERSONAL SAFETY EQUIPMENT FIRST AID APPARATUS, TREATMENT etc.**

The contractor shall provide all necessary personal safety equipment and first aid apparatus for the use of the persons employed on the site and shall maintain the same in good condition suitable for immediate use, at any time and shall comply with the following regulations in connection therewith: -

- The worker will be required to use the equipment so provided by the contractor and the contractor shall take adequate steps to ensure proper use of the equipment by those concerned.
- When work is carried on in proximity to any place where there is a risk of drowning; all necessary steps shall be taken for the prompt rescue of any person in danger.
- Adequate provision shall be made for prompt first - aid treatment of all injuries likely to be sustained during he course of the work.

**Clause 26. Minimum Age of Person Employed by Contractor**

**(a): No contractor shall employ**

- Any person who is under age of 18 years.
- Who does not produce a valid certificate of vaccination against epidemic deceases in respect of himself/ herself as well as all the members of his/her family.

**(b)** The contractor shall provide potable water facilities to the workers. Similar amenities shall be provided to the workers engaged on large works in urban area.

**(c)** Removal of persons not satisfying conditions (a) (i) & (ii)

The Project Engineer cum Estate officer or other authority is authorized to direct the removal or to remove through - his own agency, from the work any person referred to in sub-clauses (a) above not satisfying these conditions and no responsibility shall be accepted by the Institute for any delay caused in the completion of the work by such directions for removal.

**(d)** Payment of fair and reasonable wages by contractor.

The contractor shall pay fair and reasonable wages, which shall not be less than the minimum wages fixed by Govt. of India from time to time to the workmen employed by him in the contract undertaken by him. In the event of any dispute arising between the contractor, and his workmen on the ground that the wages paid are not fair and reasonable the dispute shall be referred without delay to the Project Engineer cum Estate officer or other competent authority, who shall decide the same. The decision shall not in any way affect the conditions in the contract regarding the payment to be made by Institute at the agreed tender rates.

**Clause 27. CONTRACTOR NOT ENTITLED TO ANY CLAIM OR COMPENSATION FOR DELAY IN EXECUTION OF WORK IN BORROW PITS.**

The contractor shall not be entitled to claim compensation if there is any delay in the execution of the work on account of water standing in borrow pits and Compartments. The rates are inclusive for hard or cracked soil, excavation in mud, sub-soil water or water standing in borrow pits and no claim for extra rate shall be entertained, unless otherwise specified.

**Clause 28. METHOD OF PAYMENT OF BILLS**

Payment to contractors shall be made by RTGS by the Institute.

**Clause 29. SET OFF AGAINST ANY CLAIM OF INSTITUTE**

Any sum of money due and payable to the contractor (including the security deposit refundable to him) under this contract may be appropriated by the Institute and set off against any claim of Institute in respect of a payment of a sum of money arising out of or under any other contract made by the contract with the Institute.

**Clause 30. RATES INCLUSIVE OF SALES TAX AND LABOUR CESS AND ROYALTY**

**(a)** The rates to be quoted by the contractor shall be inclusive of all taxes like GST , Labour cess, Royalty etc., No extra payment on this account will be made to the contractor.

**(b)** When there is a change in existing taxes from time to time i.e. upward or downward is admissible accordingly

**(c)** All quarry fees, octroi dues levied by the state or any local body or authority and ground rent, if any, charged by the Project Engineer cum Estate officer for stacking materials should be paid by the contractor.

**Clause 31. IMPORTANCE OF SAFETY**

In addition to Contractor's Contractual Obligations on Safety as per the relevant clauses stated, The Contractor shall comply with all safety standards to the satisfaction of the Employer's Representative.

In respect of all labour, directly or indirectly employed on the project for the performance and execution of the Contractor's Work under the Contract, the Contractor shall at its own expense arrange for all the safety provisions as listed in (i) Safety codes of C.P.W.D. and Bureau of Indian Standards, (ii) The Electricity Act, (iii) The Mines Act, and Regulations, Rules and Orders made there under and such other acts as applicable. Precautions as stated in the safety clause are the minimum necessary and shall not preclude the Contractor taking additional safety precautions as may be warranted for the particular type of work or situations. Also mere observance of these precautions shall not absolve the Contractor of his liability in case of loss or damage to property or injury to any person including but not limited to the Contractor's labour, the Employer's, Architect's, Employer's Representative's and Project Manager's representatives or any member of the public or resulting in the death of any of these.

The Contractor shall institute and implement to the satisfaction of the Project Manager a construction safety programme, including:

1 Preparing a Site-specific written safety programme consistent with the EHS Plan, Indian law and best practices. As a minimum, the programme shall require applicable safety equipment for all workers, use of barriers and barricades around potentially dangerous areas, protection of workers working under elevated conditions, accident reporting, first aid provisions etc.

2 Weekly safety reviews and 'risk assessments' shall be carried out in conjunction with the Project Manager and the Employer in order to identify potential safety hazards and to mitigate against them.

3 Attending weekly or as scheduled safety meetings at site conducted by the site safety representative of project manager

4 The Contractor will be required to provide all personnel entering the Site an Identity and safety rules card and verbal explanation of the safety programme.

5 Requiring all Sub-Contractors and other workers under the responsibility of the Contractor (including the Vendors or later phases of the construction of the Project) to adhere to the written safety programme as per approved format.

Experienced safety officers with adequate number of supporting personnel shall be appointed by the Contractor for full time on the site during the Contract period.

NON-COMPLIANCE OF REGULATIONS

If the Project Manager or the Employer's Representative notifies the Contractor of non-compliance with the foregoing regulations, the Contractor shall immediately, if so directed, or in any event not more than eighteen (18) hours after receipt of such notice, make all reasonable efforts to correct such non-compliance. If the Contractor fails to do so, the Employer may suspend all or any part of the Work. When the Contractor has undertaken satisfactory corrective action, Employer shall lift the suspension of the Work. The Contractor shall not claim any extension of time to complete the Work or additional fees due to any such work suspension.

The Client reserves the right to levy penalty if the safety norms such as not wearing helmets, safety gloves/belts/shoes/jackets. etc., even after a written notice by the enforcing authority, a penalty of Rs. 10,000/- per day per event or till the safety norms are adhered to in addition to stopping of work till the safety norms are adhered

**Clause 32 Refund of Security Deposit (EMD & SD):**

The Security Deposit lodged/paid by a Contractor shall be refunded to him after the final bill is paid or after the successful completion of defect liability period, during which period the work should be maintained by the Contractor in good order, whichever is later.

**Clause 33 BAR CHART / CPM CHART:**

BAR chart /CPM chart shall be produced during agreement by the contractor. According to the bar chart work is to be executed otherwise penalty will be levied for the delay of work

**THE ARTICLES OF AGREEMENT**

This Agreement is made at Bangalore, on this **XXth day of MONTH** in the year **TWO THOUSAND AND TWENTY THREE (XX.XX.2023)**.

BY AND BETWEEN

**INDIAN INSTITUTE OF SCIENCE** herein referred as IISc, a Trust registered under the Charitable Endowments Act, 1890, a deemed University and an autonomous Institution funded by the Ministry of Education, Government of India having its office at **Sir C.V Raman Road, Malleswaram, BANGALORE 560 012**, represented by the **Registrar IISc**, Bangalore (hereinafter referred to as the IISc which expression shall unless repugnant to the context or meaning thereof, mean and include its successors in interest, trustees and permitted assigns) of the ONE PART

AND

**M/s xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx Bangalore – 56003xx**, hereinafter referred to as the "CONTRACTOR", (which expression shall unless repugnant to the context or meaning thereof, mean and include their partners, their respective heirs, executors, administrators and assigns) on the OTHER PART.

**RECITALS**

WHEREAS the IISc is desirous of getting the work of "**Supply, Installation, Testing and Commissioning of Compact Substation for new buildings in IISc, Bangalore."** (hereinafter called the work) executed by the Contractor at the rates quoted by him amounting to **Rs.xxxxxxxxx (Rupees xxxxxxxxxxxxxxxxxxxxxxxx only**) Inclusive of all Taxes which is **xxx% Above/Below** the estimated amount put to tender.

**B**. WHEREAS the Contractor has agreed to execute the aforesaid work on terms and conditions mentioned herein and subject to Tender Conditions of Contract and in accordance with the particular specifications, general notes and the schedule of quantities, schedule of rates, payment, and penalty condition, to the satisfaction of the IISc, Bangalore

**NOW THIS AGREEMENT WITNESSETH AND THE PARTIES HERETO AGREE AND SOLEMNLY AFFIRM AS FOLLOWS:**

1. In consideration of the payment to be made to them as hereinafter provided, the contractor shall, subject to the terms, conditions, specifications, schedule of quantities, drawings, etc., more particularly stated in the Schedules aforesaid, execute and complete the work within **12 Months** for the work after 10 days of issuance of work order or from the date of handing over of site, whichever is later.

2. IISc shall pay to the contractor such sums as shall become payable hereunder at the time and in the manner specified in the conditions contained in the schedule aforesaid.

3. The time allowed for carrying out the work as entered in the tender Agreement shall be strictly observed by the contractor and shall be deemed to be the essence of the contract on the part of the contractor and shall be reckoned from 10 days after the date on which the work order to commence the work is issued to the Contractor or the date of handing over of site, whichever is later. The work shall throughout the stipulated period of the contract be proceeded with all due diligence and the Contractor shall pay compensation an amount equal to one percent, or such smaller amount, as the Director, Indian Institute of Science (whose decision shall be final) may decide on the amount of estimated cost of the whole work as shown in the tender for every day that the work remains un-commenced or unfinished, after scheduled dates.

4. The contractor shall ensure good progress during the execution of the work be bound in all cases in which the time allowed for any work exceeds one month (save for special jobs) to complete Mile stone-1 i.e.15% of the whole work before the time allowed under the contract has elapsed, Mile stone-2 35% of the work before the time has elapsed, Mile stone-3 60% of the work before the time has elapsed, Mile stone-4 80% of the work before of the time has elapsed,100% of the work before completion of such time has elapsed.

However, for special jobs if a time schedule has been submitted by the contractor and the same has been accepted by the Project Engineer-cum-Estate Officer, CCMD the contractor shall comply with the said schedule. In the event of the Contractor failing to comply with the conditions he shall be liable to pay as compensation an amount equal to one percent or such smallest amount, as the Director, Indian Institute of Science (Whose decision in shall be final), may decide on the said estimated cost of the whole work for every day that the due quantity of work remains incomplete; provided always that the entire amount of compensation to be paid under the provisions of this clause shall not exceed seven and a half (10%) percent of the estimated value of the contract as shown in the tender, provided further that in the event of contractor making up the short fall in progress within the stipulated or extended time of completion, the penalty so recovered may be refunded on an application in writing by the Contractor.

5. The Engineer in charge shall review the progress of all works with the contractor once every week. Such a review shall take into account the programme fixed for the previous week, obligations on the part of the Institute for issue of drawings etc., and also the obligations on the part of the Contractor. The review shall also examine the accumulated delays by the contractor if any and

mitigation measures proposed by the contractor to overcome the delay. In case the progress achieved falls short by more than 25 percent of the cumulative programme, the reasons for such shortfall shall be examined and a record made thereof apportioning the responsibilities for the delay between the IISc and the contractor. This record should be signed in full and dated both by the Project Engineer and the Contractor.

6. The Director, Indian Institute of Science, without prejudice to its rights under the contract in any respect of any delay or inferior workmanship or otherwise, or to any claim for damages in respect of any breaches of the Contract and without prejudice to any rights of remedies under any of the 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: -

(i) If the contractor having been given by the Project Engineer-cum-Estate Officer, CCMD a notice in writing to rectify reconstruct or replace any defective work or that the work is being performed in any inefficient or otherwise improper or unworkmanlike manner, shall omit to comply with the requirements of such notice for a period of seven days of such notice thereafter or if the contractor shall delay or suspend the execution of the work so that in the judgment of the Project Engineer-cum-Estate Officer, CCMD (which shall be final and binding) either they will be unable to secure completion of the work by the date for completion of the work or they had already failed to complete the work by that date.

(ii) If the Contractor being a company passes a resolution or if the Court passes an order to wind up the company or if a receiver or a manager is appointed on behalf of the creditors of the company or under circumstances which entitles the Court or the creditors to appoint a receiver or manager which would entitle the Court to make a winding-up order.

(iii) If the Contractor commits breach of any of the terms or conditions of this contract.

(iv) If the contractor assigns or sublets without written approval of the Project Engineer-cum-Estate Officer, CCMD or becomes insolvent.

**The Director of the Institute shall have following powers:**

a) To determine or rescind the Contract as aforesaid (in which termination or recession notice in writing to the Contractor underhand of the Project Engineer-cum-Estate Officer, CCMD shall be conclusive evidence). Upon such determination or recession the security deposit of the Contractor shall be liable to be forfeited and shall absolutely be at the disposal of Institute.

(2) To employ labor paid by the Institute and supply materials to carry out the work or any part by debiting the Contractor with the cost of the labor and the price of the materials (of the amount of which cost and price certified by the Project Engineer-cum-Estate Officer, CCMD shall be final and conclusive against the Contractor) and crediting him with the value of the work done in all respect on the same manner and at the same rates as if it has been carried out by the contractor under the term of his contract. The certificate of the Project Engineer-cum-Estate Officer, CCMD as to the value of the work done shall be final and conclusive against the contractor, provided always that action under the sub-section shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the Institute are less than the amount payable to the contractor at his agreement rates, the difference shall not be paid to the Contractor.

(3) After giving notice to the contractor to measure up the work of the contractor and to take such part thereof as shall be un-executed out of their hands and to give it to another contractor to complete in which case any expenses which may be incurred in excess a sum of which would have been paid to the original contractor if the whole work had been executed by him (of the amount of which excess the certificate in writing of the Project Engineer-cum-Estate Officer, CCMD shall be final and conclusive) shall be borne and paid by the original contractor and may be deducted from any monies due to him from the Institute under this contract or any other account whatsoever, of from his security deposit or the proceeds of sales thereof, or a sufficient part thereof as the case may be.

In the event of any one or more of the above courses being adopted by the Project Engineer-cum-Estate Officer, CCMD, the contractor shall have no claim to compensation for any loss sustained by them by reason of having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case of action is taken under any of the provisions, aforesaid, the contractor shall not be entitled to recover or be paid any sum for work thereto/for actually performed under this contract unless the Project Engineer-cum-Estate Officer, CCMD has certified in writing the performance of such work and the value payable in respect thereof and they shall only be entitled to be paid the value so certified.

7. The schedules above mentioned include the General Rules and Directions to Contractors and the following documents, viz.,
   i) Letter of Intent
   ii) Letter of Acceptance
   iii) Work Order
   iv) Conditions of Contract
   v) Contractor's Bid – Bill of Quantities
   vi) Technical Specifications
   vii) Drawings
   viii) The pre-Bid meeting proceedings and corrigendum
   ix) Any other document listed in the Contract Data as forming part of the contract shall form an integral part of the agreement and the decision of the Project Engineer-cum-Estate Officer, CCMD in reference to all matters of a dispute as to material and workmanship shall be final and binding on both the parties.

8. The IISc reserves the right of altering the drawings of the works and of adding to or omitting any item of work from or of having portions of the same carried out departmentally or otherwise and such alterations or variations shall not violate this agreement.
9. This agreement comprises the work aforesaid, and all subsidiary works connected therewith even though such works may not be shown on the schedule appended hereto.
10. In the event the contractor or their employees, agents, sub-contractors deface or destroy the property or the establishment belonging to IISc, the same shall be made good by the contractor at their own expenses.
11. The Contractor shall ensure cleanliness at the premises of IISc ensure cleaning of site and removal of debris every week. In any event the contractor ceases to comply the foregoing the IISc shall ensure the site cleaned at the expense of the contractor.
12. The Contractor shall at all time be responsible for the safety of their employees, agents, sub-contractors, and in any event during the commission of work or in their due course of work the IISc shall not be held responsible. The contractor shall defend, indemnify and hold the Institute harmless from any liability or damage, law suits, penalties imposed by any State or Central Government or statutory body or by a third party for reasons of violation of any of statutory provisions or requirements by the contractor.
13. The Contractor shall adhere to the working conditions and its scope strictly and any act not in confirmation with the scope of work which is mutually accepted by both the parties shall only be done after prior approval and acceptance in writing by the Director.
14. The Contractor shall at any time be responsible for the completion of work in time, also the contractor shall be responsible to submit the final bill within one month after completion of the work.
15. Notwithstanding anything contained in the tender submitted by the contractor, all the clauses of this agreement shall be binding on both parties.
16. Where counter-terms and conditions, printed or copied, are offered by the contractor, the same shall not be deemed to have been accepted by the IISc, unless specific written acceptance thereof is furnished by the IISc. Notwithstanding the foregoing, no verbal agreement or inference from a conversation with any office members/representatives/employees of the IISc before, during, or after the execution of the agreement, shall in any way affect or modify any of the terms/obligations contained herein.
17. In the event the contract is terminated by the IISc due to any aforementioned act/omission on the part of the contractor, or for any reason whatsoever, the IISc shall be entitled to engage

the services of any other person, agency or Contractor to meet its requirement, without prejudice to its rights including claim for damages against the Contractor.

18. This agreement can be terminated by IISc with the prior written notice of Seven (7) days in the event of a breach of any of its terms of this agreement and even otherwise this Agreement may be terminated by IISc by giving a minimum of 7 days prior written notice to the Contractor.

19. The IISc shall be indemnified for all losses due to commissions and omissions of persons deployed by the contractor. If any loss or damage is caused to the IISc on account of any negligence, carelessness, acts of omissions. commissions of contractors, its employees or staff, the same shall be made good by the contractor. The contractor shall defend, indemnify and hold the Institute harmless from any liability or damage, law suits, penalties imposed by any State or Central Government or statutory body or by a third party for reasons of violation of any of statutory provisions or requirements by the contractor. The IISc shall not be liable for any damage or compensation payable to any workmen or to any person as a consequence of this work and the IISc shall be completely indemnified accordingly.

20. The contractor shall pay wages directly to its personnel The contractor shall also ensure that no amount by way of commission or otherwise is deducted from the wages of the workmen. The contract labourers deployed by the agency shall not involve in any theft/pilferage/damage to Institute property. After necessary investigations, if proved that the contractor or their personnel are responsible for the incident, the contractor is liable and will be penalized to the extent of the value of the loss and additionally Rs. 50,000/- for each such incident.

21. All terms and conditions, the scope of work, and other conditions as mentioned in the tender document will be diligently complied by the contractor. The terms and conditions, the scope of work, and other conditions mentioned in the tender documents shall form a part and parcel of this agreement.

22. The Contractor hereby agrees and affirms that during or subsequent to the performance of the duties under this Agreement, the Contractor shall maintain confidentiality and shall not divulge, communicate, use or appropriate any of the IISc Information, except to the extent necessary for the Contractor to fulfill his obligations or duties to the IISc under this Agreement. The Contractor shall not cause transmission, removal or transfer of tangible embodiments of, or files from the IISc place of business, without the prior written consent of the IISc and shall not disclose any information of the IISc to any third part

23. In case of disputes including all questions relating to the performance of the obligations under this agreement and all the dispute and differences which shall arise either during or after the agreement period or other matters arising out of or relating to this agreement or payments to be made in pursuance thereof shall be decided by the Director of IISc whose decision shall be binding on the contractor. The Contractor hereby agrees to be bound by the decision of the Director, IISc.

24. **COURTS:**

Courts of appropriate jurisdiction situated in Bangalore City shall have exclusive jurisdiction. Any dispute or difference arising between the parties to the agreement in relation to any of the matters specified herein, shall be settled in the Courts of appropriate jurisdiction situated in Bangalore City which shall have exclusive jurisdiction in regard to any matter arising under or in relation to this agreement. Laws of India and the State of Karnataka, shall be applicable in this regard

25. **GOVERNING LAW**

This Contract shall be governed by the Law of India for the time being in force

IN WITNESS WHEREOF the parties hereto have set their respective hands the day and the year here in above written.

In the presence of:
Witness 1:

Signed by for and on behalf of the said Contractor.

(Company Name)

In the presence of:
Witness 2:

Signed by for and on behalf of the IISc.

REGISTRAR
INDIAN INSTITUTE OF SCIENCE
BANGALORE-12

**MEMORANDUM OF WORK**

**INDIAN INSTITUTE OF SCIENCE, BANGALORE-12**
**ITEM RATE TENDER FOR WORK**

| | | |
|---|---|---|
| 1. | General Description | **Supply, Installation, Testing and Commissioning of Compact Substation for new buildings in IISc, Bangalore.** |
| 2. | Estimated Cost | **Rs.5,17,21,488.00** |
| 3. | Earnest Money | **Rs.7,75,822.00** |
| 4 | Date of Commencement of work | Within ten days from the date of issue of work order or the date of handing over the site whichever is later |
| 5 | Frequency of interim Certificate and payment | Once every month. |
| 6. | Further Security Deposit | 6% on the running account bills and final bill in addition to Earnest Money Deposit. When the S.D. deducted from the RA bills of the Contractor @ 6% of the bill amount exceeds Rs.1.00 lakhs, the amount in excess of Rs.1.00 lakh may, at the request of the Contractor, be released to him against the production of a bank guarantee issued by a Nationalized Bank only for an equal amount in the prescribed form. The bank guarantee should be valid till the completion of the period mentioned in page 2 of Sl.No.1. |
| 5. | Time allowed for the completion of work in all respects from the date of commencement of work | **5 Months** |
| 6 | Bills Of Quantities. | As per enclosure. |
| 7 | Defects liability period /release of security deposit. | The security deposit lodged/paid by a contractor shall be refunded to him after the final bill is paid or after Twenty Four **24 months** from the date of completion of the work, during which period the work so executed should be maintained by the contractor in good order, whichever is later. |
| 8 | Period for payment of Running Bill. | Four weeks from the date of submission of each Running account bill by the Contractor. |
| 9 | Period for submitting the final Bill. | One month from the date of virtual completion of the work by the Contractor. |
| 10 | Specifications. | The work shall be carried out strictly in accordance with the enclosed specifications and wherever items are not covered by those specifications in accordance with specifications/drawings /designs/requirements and directions of the Project Engineer-cum-Estate Officer, CCMD |

I/We, hereby tender for the execution for the Indian Institute of Science, Bangalore-12 of the works specified in the under mentioned memorandum within the time specified in such memorandum at the rates specified therein and in accordance, in all respects, with the

specifications, designs, drawings and instructions in writing which have been read by me/read and explained to me and with such materials as provided for by and in all other respects in accordance with such conditions as for as possible.

I/We hereby agree to abide by and fulfill all the terms and provisions of the conditions contained in the articles of agreement, which have been read by me/us or in default thereof to forfeit and pay to the Registrar, Indian Institute of Science or his successors he sums of monies mentioned in the said conditions

The sum of **Rs.7,75,822.00 (Rupees Seven Lakh Seventy Five Thousand Eight Hundred Twenty Two Only)** has been deposited in cash/bank draft as Earnest Money the full value which is to be absolutely forfeited to the Registrar or his successors in Office should I/We fail to commence the work specified in the above memorandum and complete the same.

Dated this XX **day of XX 2023**.

**Signature of the Contractor**

**Witness to Contractor/s Signature:**
NAME
ADDRESS
OOCCUPATION

The above tender is hereby accepted by me on behalf of the Indian Institute of Science, Bangalore-12.

**REGISTRAR**
**INDIAN INSTITUTE OF SICENCE**
**BANGALORE**.

**Indian Institute of Science, Bangalore-12**
**A P P E N D I X**

| | |
|---|---|
| 1.Name of the work | **Supply, Installation, Testing and Commissioning of Compact Substation for new buildings in IISc, Bangalore.** |
| 2.Date of commencement of work | Within Ten days from the date of issue of work order or the date of handing over the site whichever is later |
| 3.Time of Completion | **5 Months** |
| 4.Frequency of interim Certificate and payment | Once in every month. |
| 5.Further Security deposit | 6% on the running bills and final bill in addition to earnest money deposit. When the S.D. deducted from the R.A. Bills of the contractor @ **6%** of the bill amount exceeds Rs.1.00 Lakhs, the amount in excess of Rs.1.00 Lakh may, at the request of the contractor, be released to him against the production of bank guarantee issued from a Nationalised /Scheduled Bank only for an equal amount in the prescribed form. The bank guarantee should be valid till the completion of the defect liability period. |
| 6. Defects liability period / retention amount from the final bill/release of balance of deposit. | The security deposit lodged/paid by a contractor shall be refunded to him after the final bill is paid or after Twenty Four 24 months from the date of completion of the work, during which period the work so executed should be maintained by the contractor in good order, whichever is later. |
| 7. Penalty for delay | In respect of the shortfall in progress, assessed as due to the delay on the part of contractor as per clause 2(b) and 2(c), the contractor shall be liable to pay as penalty an amount equal to one percent of the estimated cost of the balance work assessed according to the programme, for every day that the due quantity of work remains incomplete, provided always that the total amount of penalty to be paid under the provisions of this clause shall not exceed 7 ½ percent of the estimated cost of the entire work as shown in the tender, provided further that in the event of the contractor making up the shortfall in progress within the stipulated or extended time of completion, the penalty so recovered may be refunded on an application in writing by the contractor. |
| 8. Period for payment of Running Bill | Three weeks from the date of submission of each Running account bills by the Contractor. |
| 9. Period for submitting the final Bill | One month from the date of virtual completion of the work by the Contractor. |

## 10. REFERENCES

### I.S. STANDARDS OF ELECTRICAL WORKS

| Sl.No | STANDARDS | TITLE |
|---|---|---|
| | **Code of Practice / Guide** | |
| 1 | IS : 732 – 1989 | Code of Practice for Electrical wiring installations. |
| 2 | IS : 4648 – 1968 | Guide for Electrical layout in residential buildings |
| 3 | IS : 80614 – 1976 | Code of Practice for Design, installation and maintenance of service lines up to and including 650V. |
| 4 | IS : 7752 (Part-1) - 1976 | Code of Practice for interior illumination : General requirements and recommendations for welding interiors. |
| 5 | IS : 4347 – 1967 | Code of Practice for hospital lighting |
| 6 | IS : 6665 – 1972 | Code of Practice for industrial lighting |
| 7 | IS : 2672 – 1966 | Code of Practice for Library lighting |
| 8 | IS : 10118 (Part-1) - 1982 | Code of Practice for selection, installation and maintenance of switcher and Control gear : Installation. |
| 9 | IS : 4146 – 1983 | Application guide for voltage transformers. |
| 10 | IS : 3043 – 1987 | Code of practice for earthing. |
| 11 | IS : 5216 (Part-2) - 1982 | Guide for safety procedures and practices in electrical work : General. |
| 12 | IS : 4237 – 1982 | General requirements for switchgear and control gear for voltages not exceeding 1000 V AC or 1200 V DC. |
| 13 | IS : 6875 - (Part-1) - 1973 | Control switches (Switching devices for control and auxiliary circuits including 1000 V AC and 1200 V DC : General requirements and tests. |
| 14 | IS : 10027 – 2000 | Composite units of Air-Break switches and rewireable type fuses for voltages not exceeding 650 V AC. |
| 15 | IS : 4064 (Part-1) - 1978 | Composite units of Air-Break disconnector, Air-Break switch disconnector and fuse- combination units for voltages not exceeding 1000 V AC or 120 V DC : General requirements. |
| 16 | IS : 8828 – 1996 | Electrical accessories - circuit breakers for over current protection for household and similar installation. |
| 17 | IS : 2516 (Part-1/Sec01)-1985 | Circuit-Breaks : Requirements and tests : Voltages not exceeding 100 V AC or 1200 V DC. |

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| 18 | IS : 5039 – 1983 | Distribution pillars for Voltages not exceeding 1000 V AC or 1200 V DC. |
| 19 | IS : 8544 (Part-4) - 1979 | Motor starters for voltages not exceeding 1000 V : Reduced voltage AC starters, two- step auto transformer starters. |
| 20 | IS : 9537 (Part-1) - 1980 | Conduits for electrical installations General requirements |
| 21 | IS : 9537 (Part-4) - 1983 | Conduits for electrical installations : Pliable self recovering conduits of insulating materials. |
| 22 | IS : 3854 – 1997 | Switches for domestic and similar purposes. |
| 23 | IS : 1293 – 1988 | Plugs and sockets outlets of rated voltage up to and including 250 Volts and current up to and including 16 Amperes. |
| 24 | IS : 2418 (Part-1) - 1977 | Tubular Fluorescent lamps for general lighting services : Requirements and tests. |
| 25 | IS : 9900 (Part-1) - 1981 | High pressure mercury vapor lamps : Requirements and tests. |
| 26 | IS : 1913 (Part-1) - 1978 | General and safety requirements for luminaries : Tubular fluorescent lamps. |
| 27 | IS : 10322 (Part-1) - 1982 | Luminaries : General requirements |
| 28 | IS : 302 (Part-1) - 1979 | General and safety requirements for household and similar electrical appliances. |
| 29 | IS : 6236 – 1971 | Direct recording electrical measuring instruments. |
| 30 | IS : 2705 (Part-1) - 1992 | Current transformers : General requirements. |
| 31 | IS : 2448 (Part-1) - 1963 | Adhesive insulating tapes for electrical purposes : Tapes with cotton textile substrates. |
| 32 | IS: 8130-1984 | Code for Conductor Construction |
| 33 | IS: 5831-1984 | Code for Insulation & sheath material |
| 34 | IS:694-1990 | PVC insulated Flexible Single Core Wire/ Unarmoured Multicore/ Flat Cables. For working voltage upto & including 1100V. |
| 35 | IS:1554(Part-1)-1988 | Copper or Aluminium Conductor, PVC insulated, extruded inner sheathed PVC, galvanised steel wire/strip armoured, extruded PVC sheathed LT Control/Power Cable. For working voltage up to & including 1.1KV. |
| 36 | IS:3975-1990 | Code for Number of Strips in armouring construction. |

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|---|---|---|
| 37 | IS: 7098/II/85 | XLPE insulated HT & AB Cables. For working voltage 6.35/11KV. |
| 38 | IS:14255-1995 | Code for Aerial Bunched Cables.For working voltage up to 1.1KV. |
| 39 | IS:13573/VDE 0278/IEC 60502/HD 629.1.S2 CENELEC | Code of Type tests for HT termination jointing kit. |
| 40 | IS 7569:1987 | Cast Acrylic Sheets for use in Luminaires |
| 41 | IS 8030:1976 | Specifications for Luminaires for Hospitals |
| 42 | IS 10242: Part 3: Sec 6: 1986 | Electrical installations in ships: Part 3 Equipment, Section 6 Luminaires & accessories |
| 43 | IS 10322: Part 2 1982 | Specification for Luminaires - Part 2: Constructional Requirements |
| 44 | IS 10322: Part 3 1984 | Specification for Luminaires - Part 3: Screw & Screw Less Terminals |
| 45 | IS 10322: Part 4 1984 | Specification for Luminaires - Part 4: Method of Tests |
| 46 | IS 10322: Part 5: Sec 1: 2012 | Luminaires: Part 5 Particulars requirements, Sec 1 General Purpose Luminaires |
| 47 | IS 10322: Part 5: Sec2: 2012 | Specifications for Luminaires - Part 5 : Particular Requirements - Section 2: Recessed Luminaires |
| 48 | IS 10322: Part 5: Sec4: 1987 | Luminaires: Part 5 Particulars requirements, Section 4 Portable general-purpose luminaires |
| 49 | IS 13383: Part 1 : 1992 | Photometry of Luminaires - Method of Measurement - Part 1: Luminaires for use in interior Lighting |
| 50 | IS 13383: Part 2 : 1992 | Methods of Photometry of luminaires: Part 2 Luminaires for road & street lighting |
| 51 | IS 13383: Part 3 : 1992 | Photometry of Luminaires - Method of Measurement - Part 3: Luminaires for Floodlighting |
| 52 | BSEN 10025 Grade 5, 355JO (or) ASTM A 572-50 | Steel sheet thickness |
| 53 | IS 875 Part 3 | Wind Velocity |
| 54 | IS 2062 (or) ASTM A 572-50 | Base Plate |
| 55 | BSEN ISO 1461 (or) ASTM A123 (or) IS 2629 | Galvanized in single hot dip / With Average 70 Microns |
| 56 | BS 5135 | Welded Single L-Seam Joint |
| 57 | AISI 304 Grade | Stainless Steel Wire Rope (Factor of Safety: TR No. 7) |
| 58 | IS 1239 | Maximum Load Carrying Capacity (Lantern) |

| | | |
|---|---|---|
| 59 | IS 9595 (or) IS 10178 AWS | Single Section & Single Joint welded |
| 60 | ASTM - A 123 and 153 | Hot dip Galvanized in Single dipping with not less than 65 Microns |

## ABBREVIATIONS:

The following abbreviations wherever they appear in the specifications, shall have the meaning or implication hereby assigned to them:

| | |
|---|---|
| Mm | Millimetre |
| Cm | Centimetre |
| M | Metre |
| Km | Kilometre |
| Mm /sqmm 2 | Square Millimetre |
| Cm /sqcm 2 | Square centimetre |
| Dm /sqdm 2 | Square decimetre |
| M /sqm 2 | Square metre |
| Cm / cubic cm 3 | Cubic centimetre |
| Dm / cubic dm 3 | Cubic decimetre |
| M3/cum 3 | Cubic metre |
| Ml | Millilitre |
| Kl | Kilolitre |
| Gm | Gram |
| Kg | Kilogram |
| Q | Quintal |
| T | Tonne |
| Fps system | Foot pound second system |
| °C | Degree Celsius temperature |
| Fig | Figure |
| Re/Rs | Rupee/ Rupees |
| No | Number |
| Dia | Diameter |
| AC | Asbestos cement |
| CI | Cast Iron |
| GC | Galvanised corrugated |
| GP | Galvanised plain |
| GI | Galvanised iron |
| PVC | Polyvinyl chloride |
| RCC | Reinforced cement concrete |
| SW | Stone ware |
| SWG | Standard wire Gauge |

## 11. TECHNICAL SPECIFICATION

**The work shall be carried out as per CPWD / KPWD Specification and relevant IS codes. In case of discrepancy between technical specification and BOQ, the BOQ prevails.**

## Technical Specification

**Contents**

**Brief Scope of Work**

1.1 This specification covers the design, engineering, procurement, manufacture, inspection and testing at the works of manufacturer and/ or his sub-vendor, packing for shipment, forwarding including transit insurance, receipt at site, erection, testing and commissioning of EQUIPMENT (as defined in the Specific Scope of work) under specified site conditions, complete with auxiliaries and integral systems, safety accessories, Special tools, and tackles, Training for Operating and Maintenance Personnel for IISc, Bangalore.

1.2 If any item other than those specified is required for the proper operation of the system, the same shall be brought out during pre-bid meeting and be included in the offer.

1.3 It is not the intent to specify herein completely, all the details of design and construction of the equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in continuous commercial operation in a manner acceptable to the IISc, who will interpret the meaning of the drawings and specifications and shall have the right to reject any work or material which in his judgement are not in full accordance therewith.

1.4 Any additional equipment or materials which are not specifically mentioned but are required to complete the equipment and system offered, in every respect in accordance with the technical specification and required for safe and reliable operation and guaranteed performance, shall also be deemed as included in the scope of work of this contract. The bidder shall not be eligible for any extra payment in respect of such mountings, fittings, fixtures, accessories, etc., which are needed for the safe operation of the equipment as required by applicable codes and standards, though they may not have been explicitly spelt out in the contract.

**Codes, Standards, Material and Workmanship.**

1.5 The design, material, construction features, manufacture, inspection, testing and performance of equipment shall comply with all currently applicable statutes, regulations, and safety codes in the locality where the equipment will be installed.

1.6 Equipment, associated accessories, component/parts, raw material, and tests, Installation shall conform to the latest amendments applicable.

- Indian Standard IS
- IEC standards
- CBIP manuals.
- National Building Code-2016
- National Electrical Code-2023
- Energy Conservation Building Code-2017 (ECBC-2017)

In the absence of information /missing details, CPWD specifications shall be referred to.

In case of any conflict between the standards and this specification, more stringent requirement of the two shall govern.

1.7 The electrical installation shall meet the requirement of:

- Central Electricity Authority(Measures relating to Safety and Electric Supply) Regulations, 2023.
- IS / IEC codes.

In the absence of information /missing details, CPWD specifications shall be referred to. In addition, other rules of regulations applicable to the work shall be followed.

1.8 The materials and workmanship shall meet the requirement of relevant standards and good engineering practices. In any case, the material shall be the best grade obtainable and the most suitable and proven for the purposes intended in accordance with the modern engineering practices.

1.9 All materials shall be new.Substitutions for specified materials or variations from designed methods of fabrication will be permitted only if approved in writing by the IISC/CONSULTANT. Such approvals may be granted only if a compelling reason exists for making a substitution.

1.10 Before any defect in material or workmanship is repaired, the bidder shall outline the procedure proposed for rectification of the defect and obtain approval in writing, of the IISC/CONSULTANT. Such repairs shall be done free of cost to the IISC, if the defects are established to have occurred during the warranty period.

**Documents comprising the Bid**

1.11 The bid prepared by the BIDDER shall comprise completed bid form and with complete technical details including the data sheets and all schedules completed and reference list of customers using similar equipment and materials.

1.12 Bidder's confirmation that the goods and ancillary equipment to be supplied by the BIDDER conform to the bidding documents along with Deviation from IISC's specification (technical conditions), if any.

1.13 Supplementary data for reference shall be provided as below.

a) Bidder GTP/Data sheet shall include all the parameters along with performance figures offered by BIDDER per Enquiry Datasheet.
b) Bar chart for design, manufacturing, inspection, testing & delivery schedules.
c) Brochures, standards, catalogue etc. as applicable. Relevant Catalogue with model numbers of associated equipment.
d) List of type tests carried out on the offered and associated equipment shall be furnished giving details of tests done, with the certificate number and date of certification. Type Test Reports (not older than 5 years)
e) Manufacturing Quality Approval Plan List of Routine tests during Factory Acceptance.
f) Packing Procedure.
g) Layout drawings and sketches with dimensions of equipment and indicating limits of supply.
h) List of Spare parts for the erection and commissioning.
i) List of maintenance tools and tackles.
j) Nature of maintenance assistance available / offered by BIDDER.
k) Planning for commissioning.
l) Information on shipping weights and cubage (length, width, and height) with special attention to heavy and oversize packages.
m)Training facilities available and offered.
n) Reference list of customers to whom identical/similar equipment are supplied

o) Certificates from end users regarding satisfactory performance.

1.14 Manufacturing Schedule and Hold Point

Bidder shall submit a bar chart for various activities of manufacturing, testing, inspection, and delivery. Manufacturing shall be started only after approval of documents as per enclosed "Vendor Drawings and Data" from Consultant / End User.

**Quality Assurance Plan.**

1.15 Quality Assurance (QA) shall mean the organizational set up, procedures as well as test, methods and facilities developed by bidder in order to assure that all goods supplied by the bidder are of the highest quality i.e., equal or exceeding the requirement specified by the IISC.

1.16 Quality Control (QC) shall mean all the tests, measurements, checks and calibrations to be carried out in vendor's shop in order to compare the actual characteristics of the goods with the specified ones, as well as the documentation (certificates, records) containing the data or result of these activities.

1.17 The bidder to furnish Quality Assurance Plan (QAP) for each equipment/system which shall include the following details:

a) List of areas in manufacturing process where stage inspection shall be carried out.

b) Hold points in the manufacturing process for inspection.

c) Shop test schedules for the witness the tests.

d) The hold points and shop test schedule shall be discussed before the QAP is finalised.

e) The Project Engineer cum Estate officer will do inspection at the hold points during manufacture as per approved QAP.

f) The Project Engineer cum Estate officer will witness the type and routine tests as well as other shop tests as per approved QAP.

g) The Project Engineer cum Estate officer will witness any retesting that may be required as specified.

Inspection and Factory Acceptance Test.

1.18 All the equipment, apparatus, materials and supplies provided by the bidder under this contract shall be subjected to tests in the shop and at the field in the presence of Project Engineer cum Estate officer for conformity with the requirements of the specifications.

1.19 The bidder shall give the IISC a minimum of ten (10) days' written notice whenever any equipment / component / material is ready for testing. The IISC shall attend such tests on the notified scheduled date of testing.

1.20 The costs of travel, food and lodging and other incidental expenses for Project Engineer cum Estate officer / other nominated agency for the inspection and witnessing of tests shall be borne by the bidder.

1.21 The details of the test procedures and test equipment to be used shall be intimated to the Institute. The bidder shall submit a detailed quality assurance plan within 30 days after the purchase Order.

1.22 Within 7 days of completion of each and every specified test, including commissioning tests, the bidder shall submit six signed copies of the test reports to the Institute.

1.23 The shop tests shall include type, routine and acceptance tests as applicable as well as any other tests as required.

1.24 The bidder shall, at its own expense, promptly make good all defects evident by testing or made apparent in any other ways. After defects in the equipment have been rectified, the equipment will be subjected to such retesting as may be necessary until the equipment is proved to be in satisfactory operation/condition.

1.25 Where the IISC's representative is present to witness the tests, the test certificate shall be signed by him on successful completion of tests at bidder's works.

Vendor Drawing, Data and Documentation:

1.26 Vendor shall submit the following documents, in THREE sets each to IISc and for approval after award of contract and before start of manufacture.

a) Write up / Operating Philosophy

b) Overall general arrangement drawings giving plan, section, foundation loading data (both static and dynamic), side view, etc.

c) Internal component layout drawings.

d) Sizing calculation for Equipment, Busbar selection, Cable conductor and earthing conductor selection.

e) Catalogue of the equipment along with the filled in data sheet.

f) Bill of material with type, ratings and makes of all components.

g) Single Line Diagram and Three Line Diagrams.

h) Control and schematic with ferrule and terminal numbers.

i) Testing and calibration certificate of all meters.

j) Interconnection schedule and Cable schedule.

k) List of Special Tools and Tackles

l) Rating plate diagram.

m) Paint procedure.

n) List of Tests during FAT and SAT.

o) Test Procedure.

p) Installation, Operating and service manual for all major equipment.

q) Parameterisation/settings list for devices (After SAT/commissioning).

r) Copies of valid type test certificates (not older than 5 years from the date of bidding) carried out on offered equipment shall be submitted in THREE SETS along with the drawing for review and approval.

1.27 Whether explicitly mentioned or not in the various sections of this specification, Vendor's documentation shall include hard copies of all drawings related to this package, operating and instruction manuals, training manuals, etc., in Threesets of suitably bound volumes, and Single PDF softcopy after delivery of equipment to site.

Completion Schedule:

1.28 All equipment to be procured under this specification shall be supplied to site and erected within the period as specified in the forwarding letter/Notice Inviting Tender.

1.29 BIDDER shall submit a bar chart for various activities of manufacturing, testing, inspection, delivery, erection, testing and commissioning.

Specific Scope of Work

1.30 This specification covers the design, engineering, procurement, manufacture, inspection and testing at the works of manufacturer and/ or his sub-vendor, packing for shipment, forwarding including transit insurance, receipt at site, erection, testing and commissioning of following.

A. 11/0.433 kV Prefabricated Packaged Unitised SCADA Controlled Smart COMPACT SUB-STATION (SCSS) complying to IEC-/62271-202-2014 amended up to datefully type tested including Internal Arc test.

B. Excavation and Foundation Civil works. Civil Foundation for the above Compact Sub Station as per above with necessary concrete, size stones, angles / Channels and plastering works complete in all respects as per OEM Foundation Specification & Drawings.

C. HV Side cable interconnection completes with jointing and termination materials.

D. LV Side cables cable interconnection complete with materials.

E. Earthing Conductor and Earth Pits complete with materials.

F. Cable Glands, Lugs, Tag plates, Cable Trays and other such installation accessories.

G. Other item as specified in the BOQ.

…….,under specified site conditions, complete with auxiliaries and integral systems, safety accessories, Special tools, and tackles, Training for Operating and Maintenance Personnel and final Handing over to IISc, Bangalore.

1.31 Installation, Testing and Commissioning work shall be taken up as per the END USER commissioning plan. Advance intimation of 15day will be provided. Upon such request bidder shall furnish his Plan of Activities along with general tools, tackles, measuring instruments, Commissioning Engineer shall carry any special tools required along with him.

1.32 The scope shall also include of any special accessories such as foundation channels, bases, anchor bolts.

1.33 The scope shall also include commissioning Spares, Special tools, and tackles, as mentioned elsewhere in this document,whether explicitly itemised in BOQ or not. Bidder shall include any spares required during commissioning in his base offer. Bidder shall include any special tools and tackles for safe operation and maintenance of the equipment in his base offer.

1.34 The scope shall also include End user Operating Personnel Training. Commissioning engineer during his visit shall also be able to impart Onsite training of operation & maintenance for IISC's engineers. Commissioning engineer during his visit shall also be able to impart Onsite training of operation & maintenance for IISC's engineers for Programming and Parameterisation of Relays and meters.

1.35 The scope shall also include submission for THREE Sets of As Built Drawings, Test Certificates, O&M Manuals of HARDCOPY IN in Spiral Bound Volumes and PDF Softcopy.

Definition of Equipment

1.36 In this specification and anywhere else in the document, the word "Packaged Substation/ USS/ Compact Substation SCADA Controlled Smart Substation/ SCSS

/CSS shall refer to the Ring Main Unit-RMU, Dry Type Distribution Transformer, Low Voltage Switchgear HV side Interconnections, LV Side Busbar, SCADA/RTU Hardware completely assembled and wired in Outdoor duty enclosure with integral Base Channel. The word 'equipment' shall also refer to all of the above.

Scope and limits of contract.

1.37 Bidder shall quote for all the systems covered in this specification and enclosed BOQ.

1.38 The sub-assemblies and components of CSS and its accessories offered shall in general comply to the following specification attached / enclosed herewith. The product/equipment/system shall conform to explanation furnished here in this document, namely,

| **Description** | **Data** |
|---|---|
| Priced BOQ. | As in e Portal. |
| Addendum to Tender towards Clarification during Pre-bid | If any will be uploaded in Portal. |
| Project Information | Enclosed /Attached / As specified elsewhere in this document |
| Brief Scope of Work | --do- |
| Specific Scope of Work | --do- |
| Site Environment Conditions | --do- |
| Electrical System Data | --do- |
| Specifications for CSS | --do- |
| Specifications for 11kV RMU | --do- |
| Specifications for Transformer | --do- |
| Specific Technical Requirements | --do- |
| Approved makes | --do- |
| Notes on BOQ | --do- |
| Split up BOQ-Each Substation wise for execution of work. | --do- |

1.39 All above documents shall be read in conjunction. Any discrepancy/conflict in details shall be brought to notice of IISC/CONSULTANT and clarification shall be obtained before bidding. In the absence of such written consent, stringent clause shall prevail during execution of project. Any Technical clarification raised by all the bidders will be clarified, during pre-bid meeting, recorded in writing and will be included in Tender as Addendum.

Site Environmental Condition

1.40 The equipment covered under this specification is for outdoor installation and should be suitable for use at the sites in for the prevailing climatic conditions.

1.41 All equipment supplied against this specification shall be given tropical and fungicidal treatment in view of the climatic conditions prevailing at site. Tropical protection shall conform to BS CP -1014- 1963, Protection of Electrical Power Equipment against climatic conditions.

1.42 All materials supplied shall be capable of operating without fault in a tropical climate, which exhibits a high level of ultra-violet radiation and severe thunderstorms. Relevant environmental conditions are listed as follows:

| SN | Description | Data |
|---|---|---|
| a) | Reference ambient Temperature | 43.3°C as per IS 9676. |
| b) | Maximum ambient air temperature | 45°C |
| c) | Maximum daily average ambient temperature | 35°C |
| d) | Maximum yearly average ambient temperature | 30°C |
| e) | Maximum relative humidity | 90% |
| f) | Minimum relative humidity | 10% |
| g) | Average Annual rainfall | 750mm |
| h) | Average no of rainy days/annum | 50 |
| i) | Rainy months | June to Oct |
| j) | Average number of thunderstorm days/annum | 40 |
| k) | Altitude from Mean Sea Level | 300 meters <1000m above mean sea level |
| l) | Wind pressure up to 30m elevation as per IS 875/75. | 195kg/m2 |
| m) | Area Classification | Safe / Non-Hazardous |
| n) | Pollution | Industrial-Highly Polluted-Corrosive. |
| o) | Pollution Level as per IEC-61800 | Degree 3 |
| p) | Seismic forces | Acceleration of 0.1g. |

**Electrical System Data**

1.43 **Power is fed from Grid Substations at 66kV from the where it is stepped down to the primary distribution voltage of 11kV and distributed in the entire campus with Underground cable network.**

| SN | Description | Data |
|---|---|---|
| 1) | High Voltage System | |
| | a) Source | Grid Supply /11kV DG Sets |
| | b) Type | 3 Phase, 3Wire |
| | c) Voltage-Nominal | 11kV |
| | d) Voltage-Highest | 12kV |
| | e) Voltage variation | +/-10% |
| | f) Frequency-Nominal | 50Hz |
| | g) Frequency variation | +/- 5% |
| | h) Combined voltage and Frequency variation | +/-10% |
| | i) Earthing | Solid Earthing |
| | j) Fault Level | 21kA for 3 Sec |
| | k) Power Frequency Withstand Voltage to Earth, Between Poles, & Across Opening Span<br>Across Isolating Distance | 28 kV rms for 1 minute<br>32 kV rms for 1 minute |
| | l) Basic impulse withstand voltage Phase-to-Phase & Phase-to- Earth:<br>Across Isolating Distance | 75 kV<br><br>85 kV (peak) |
| 2) | LV Power Supply | |
| | a) Source | Distribution Transformer |
| | b) Type | 3 Phase, 4Wire |
| | c) Voltage-Nominal | 415V |
| | d) Voltage variation | +/-10% |
| | e) Frequency-Nominal | 50Hz |
| | f) Frequency variation | +/- 5% |
| | g) Combined voltage and Frequency variation | +/-10% |
| | h) Earthing | Solid |
| | i) Fault Level | 50 kA for 1 Sec |
| | j) Lightning Impulse (1.2/50 micro sec wave) | 8 kV peak |
| | k) Power frequency withstand voltage | 3 kV |
| | l) Minimum clearance between Phases | 25mm |
| | m) Minimum clearance between Phase-Earth | 19mm |

**Technical Specification for Compact Substation (CSS)**

**CSS shall be designed in accordance with following standards. It shall meet the all the parts and clause of the specified standards.**

a) HV and LV PrefabricatedSubstation:62271-202-2014 latest amendment
b) Enclosure and Construction as per IS 14786
c) Rated Enclosure Class K10 as per IEC 62271–202.
d) IE Rules.
e) NEC Codes.

1.44 **Type Tested Design:**

**Offered CSS shall be fully Type tested design. Following are the minimum type test requirement. Type Tests Reports are to be submitted.**

f) Internal Arc Test on Transformer Chamber
g) Internal Arc Test on HT Compartment
h) Internal arc fault tested for 21kA, 1S IAC-AB AFLR
i) Temperature Rise Test and Enclosure Class
j) Mechanical Impact Test.
k) Radio Interference Voltage Test
l) Sound Level Test
m) Short Time Withstand current 21kA RMS for Earthing Circuit.
n) Short Time Withstand current 50kA RMS for LV Interconnection circuit.
o) IP Test on LV, HV and Transformer Compartment

1.45 **CSS-Design Objective and Criteria:**

a) The Prefabricated sub-station can be situated at ground level.

b) CSS is to be designed for locations where space and safety is a concern, population density is high, such as urban centre.

c) CSS shall be Completely Factory built and tested, Modular & Compartmentalised, reinforced with specially designed ventilation system, with Superior Aesthetics, Convenience in portability, Ready to install & Commission, compact in size, Minimal maintenance, Suitable for rooftop & Basement, Tamper proof, completely safe for operators, SCADA compatible & ready to use in smart grid.

d) The size of the substation should be compact to meet the traffic and road transportation requirements.

e) Units are to be delivered fully assembled and equipped, only the concrete foundation slab and external cable connection are required on site.

1.46 **CSS Assemblies and components.**

**The CSS shall house the following minimum components as specified in the BOQ, specification, mentioned elsewhere as part the bid document.**

a) Indoor type HV side Ring Main Unit-RMU
b) Interconnecting HV cables.
c) Transformer HV Side Surge Protector.
d) Dry Type Cast Resin Transformer.
e) Transformer Temperature monitoring (WTI with communication RS485)
f) Interconnecting LV Bus bars
g) LV side Incomer ACB with associated metering and protection.
h) LV side Bus Bar.
i) LV side Outgoing Feeder MCCB complete with terminations.
j) Earthing of all internal components.

1.47 **CSS Constructional features:**

a) **Type: CSS shall be suitable for Outdoor, Non-Walk-in type.** Sloping Roof type Canopy shall be provided.

b) **Viewing Window:** Toughened Glass viewing window shall be provided for meters and indications so that O&M personnel can visualise without opening door.

c) Terminals / Cable Entry / Exit and Gland Plates:

- Cable entry/exit to HV compartment: **From Bottom.**
- Cable entry/exit to LV compartment: **From Bottom.**
- Gland Plates: Undrilled, Removable and 3mm thick MS.
- HV terminals for terminating HV cables- inside CSS Suitable for connection. to 11 kV, 3 core x up to 400 Sqmm XLPE cable from bottom.
- Clearances in cable box shall be as pet CBIP standard. Cable boots to be provided with RMU.
- Minimum cable termination height of 600mm from gland plate.

1.48 Degree of Compartmentalisation: CSS is to be divided in three section or compartment— High Voltage, Transformer and Low Voltage Switchboard. There should be barrier for RMU section, Transformer section and LT Switchgear section for safety purpose. There should be easy access to all these three compartments independently. Degree of protection shall be;

a) IP 23/IP 34 for Transformer compartment
b) IP 54 for HT compartment
c) IP 54 for LT compartment

1.49 The Creepage and clearances between live parts and minimum clearances to earth have to be maintained to the respective product standards.

1.50 **Enclosure Body/Shell:**

- Enclosure material shall be made of **Galvanised steel-of 2.5mm thick for Load bearing members and 2mm thick** corrugated type design for Doors, for proper heat dissipation. MS Sheets are **not accepted.**
- Base shall be Hot dip galvanized minimum 6 mm thick C/ISMC Channel with integral welded Load Balancing Lifting Hooks
  - Partitions between compartments with 2mm thick GI sheet.
  - Easily removable rainwater protection canopy & roof designed to support load up to 250kg/Sqm.
  - Gaskets shall be provided for all removable plates and covers.
  - Door shall be provided stiffener as required.

1.51 **Enclosure Paint and Finish**

- The enclosure shall be painted with Epoxy based Powder Paint,
- Minimum thickness 80 micron.
- Shade -RAL ***or as per IISc request. (Cash Green Doors / Siemens Gray).
- Painting shall be suitable for Weatherproof and corrosion proof.
- Painting shall be tested for radiation test.
- Excessive use of bolts for fastening on the front side of doors shall not be allowed. If bolting is employed for fastening it should be fastened from the inside of enclosure. This is to avoid corrosion.

1.52 **Doors**

- Access to the MV & LV compartment provided through a double door arrangement.
- Door of the HT and LT compartment shall be designed such as complete door is divided into minimum two-fold / parts vertically for minimum space requirement while opening.
- Collapsible hinge mounted doors with Heavy Duty Three Point lock.
- Doors are to be provided on either side of Transformer for easy access to change tap link position.
- The compartments are to be provided with separate doors and padlocking arrangements.
- Door shall be provided with Swing Handle with Three-point latch.
- The doors shall be lockable type with cylindrical shooting bolt and the locking arrangement shall be covered by magnetic flap.

1.53 **Ventilation arrangement for Transformer Compartment.**

- Transformer compartment shall be equipped with professionally designed ventilation openings for air flow to keep transformer cool.
- Perforated sheet & air ventilation louvers shall be provided in Transformer section.
- Louvers designed for natural ventilation and thermal class **K10**.
- A floor mesh shall also be provided to restrict the entry of small animals and other foreign object.

1.54 **Safety requirement.**

- For safety purpose, the transformer compartment shall be fitted with Arc reflectors inside and Explosion Vent atop of Transformer and HV Compartment.
- Transformer compartment shall be provided with a pressure relief system integrated in the ceiling.
- Mechanical Interlocks shall be provided for doors ensuring human safety.
- For Safety Purpose Transformer Compartment shall be fitted with Door Limit Switch to Trip the HT breaker if Transformer door is open in energised state.
- Digital Temperature Indicator /Scanner with interconnecting wiring & Embedded temperature sensors in HV & LV Winding with trip contacts to be wired to trip the HV Switchgear.

1.55 **Internal Lighting, Heating and other Accessories.**

- Each compartment doors shall be fitted with Door Limit switches + LED type Lamp + MCB Protection for internal illumination purpose for HV, Transformer, LV Compartment.
- General Purpose switch Socket Unit to be provided in HV & LV Compartment.
- Space Heater+ Thermostat + MCB shall be provided in HV & LV Compartment.
- Fire extinguishers.
- Rating Plate shall be made out of Stainless Steel with letters etched complete with name of the Client and order reference. All other identification plates shall be aluminium with engraved letters permanently fixed on CSS.

1.56 **Earthing:**

- All metallic components shall be earthed to a common earthing point. It shall be terminated by an adequate terminal intended for connection to the earth system of the installation, by way of flexible jumpers/strips & Lug arrangement. The continuity of the earth system shall be ensured considering the thermal & mechanical stresses caused by the current it may have to carry.

- The components to be connected to the earth system shall include: The enclosure of Package substation, The enclosure of High voltage switchgear & control gear from the terminal provided for the purpose, The metal screen & the high voltage cable earth conductor, The transformer tank or metal frame of transformer, The frame &/or enclosure of low voltage switchgear.
- Internal earthing with 50x6mm Aluminium busbars, to be brought out of enclosure with seal off bushings at four corner points.

- Transformer Star/Neutral point with 50 x 6 mm copper busbars, to be brought out of enclosure with seal off bushings at two points.

1.57 **HV 11kV Side Interconnection and Surge Arrestor.**

- Interconnection between RMU and Transformer **11kV, 3Core X 1Run, 95 Square** mm XLPE Al cable complete with terminations on either side.

- Make of Cable termination kit for above termination shall be 3M / Raychem.
- Surge arrestors - 3 Nos. (One per Phase) on HV Side Polymeric/ Asiatic / Raychem or equivalent make Distribution Class rated on HV Side of transformer.

1.58 **LV 415V Side Interconnection**

- All the Busbar and it's connection shall be easily accessible for maintenance.
- **Connection between LT terminal of transformer to ACB shall be by Aluminium busbar only and use of Cables is not allowed.**
- Bus bar shall be sized as per the associated Full rated current of Switchgear. Bus bar shall be of high conductivity aluminium / Copper (E91E),
- Recommended Current Density shall be **1A /Sqmm for Aluminium and 1.2A/Sqmm for Copper conductor.**
- The hot spot temperature of bus bars including joints at design ambient temperature shall not exceed **95 degree C for normal operating conditions.**
- The main bus bars shall have uniform current ratings throughout their length as specified in data sheet / job specification.
- The current rating of the neutral shall be half that of the phase busbars. 4 Pole MCCB to be offered.
- Both horizontal and vertical bus bars, bus joints and supports shall be capable of withstanding dynamic and thermal stresses of the specified **short circuit currents for 1 second.**
- Only zinc passivated or cadmium plated high tensile strength steel bolts, nuts and washers shall be used for all bus bar, joints and supports.
- Bus bar shall be supported on insulators made of non-hygroscopic, non-inflammable material with tracking index equal to or more than that defined in BIS.
- The current rating as defined for Switchboard and components in data sheet / job specification are for design ambient temperature at site conditions and for being inside the cubicle at fully loaded condition. The vendor shall suitably derate the nominal rating to suit the above condition.
- All bus bars shall be insulated with **heat shrink PVC sleeves of 1100V grade**, Red-Yellow and Blue colour shall be used for phase bus bars and black colour shall be used for neutral bus bars.
- Removable type shrouds shall be provided for joints.

1.59 **CSS-LV 415V Switchgear and Control gear.**

**Incomer Side.**

a) **1250A, Four Pole (4P),** Electrically Operated **Drawout** (EDO) ACB ,50kA Icu=Ics=Icw with microprocessor based Over current (40~100% Settable), Short Circuit (1.5-10 Ir settable) & Earth Fault (30-100%), LSIG Releases, Spring Charging Motor, Closing Coil, Tripping Coil, Aux/Alarm Contacts, Safety Shutters.

**b) Protection System**

- Surge arrestors/TVSS – Three Phase +Neutral on LV Side, 50kA (OBO-betterman or equivalent make).
- Earth Leakage Relay (30-3000mA) with digital display of leakage current and site adjustable alarm / trip setting.
- Phase Sequence Indication Meter/Under /Over Voltage / Phase Sequence Relay with Test feature.
- Temperature Scanner with Alar/Trip Contact and RS-485 Modbus communication port for Transformer Monitoring.
- Two Element Electromechanical Type Transformer Fault Auxiliary Relay.
- Alarm Annunciator+ Hooter or Tower Light Audio-Visual annunciation for alarms and trips.

**b) Metering, Indication and Control**

- Metering Current Transformer: ---/1A 10VA, Cl: 0.5
- MFM-Multifunction/ LM-Load Manager / PQM- Power Quality Meter-Cl 0.5 with, Phase Sequence Indication, Maximum Demand kVA indication, Total Harmonic Distortion, RS-485 Modbus communication port.
- **Space/Cutout/Wiring provision for Smart meter by IISc.**
- 22.5mm Dia LED type, RYB Phase Indicating, CB ON/OFF/TRIP Spring Charged Lamps, AC ON, Heater ON etc.,ACB ON/OFF/ E.Stop Push Buttons.
- Control MPCB-50kA and MCBs.

**Outgoing Side.**

a) **3Nos of 630AFour Pole (4P),** MCCB,50kA Icu=Ics with microprocessor based Over current (40-100% adjustable), Short Circuit Releases (LSI), Aux/Alarm Contacts,Door Interlocked Rotary Handles and Spreader/Phase barrier for Terminals.
b) **3 Nos of 400AFour Pole (4P),** MCCB, 50kA Icu = Ics with microprocessor based Over current (40-100% adjustable), Short Circuit Releases (LSI),Aux/Alarm Contacts, Door Interlocked Rotary Handles and Spreader/Phase barrier for Terminals.
c) 22.5mm Dia LED type, RYB Phase Indicating, CB ON/OFF/TRIP Lamps.

1.60 **LV output Cable Termination facility.**

- Non-metallic barrier shall be provided between MCCB compartments.
- MCCB feeder compartment shall have Door Interlocked Rotary Handle.
- Non-metallic phase separator shall be provided between the three phases connected to MCCB.
- Cable Termination Height from Gland plate shall be around 600mm.
- Independent termination facility for 3Runs (630A) / 2Runs for 400A feeders.

1.61 **Wiring.**

- All Metering Circuit and Control Circuit shall be protected using Four pole and Two Pole MPCB/ MCBs as per the fault level.
- The Secondary Terminals of the CT's shall be individually wired, using 2.5 Sq.mm flexible copper FRLS wires (with colour coding, and ferrules at both ends) up to a Terminal block. CT Secondary Testing and Disconnecting Type Terminal Blocks shall be provided. Terminal Block shall be located, fixed at a suitable height.
- The 415V/230V Metering and Control Circuit shall be individually wired, using 1.5 Sq.mm flexible copper FRLS wires (with colour coding, and ferrules at both ends).
- 230VAC Control Circuit shall be Gray.

1.62 **Auxiliary supply.**

- 3 phases with neutral, 440V AC supply shall be tapped from main bus bar after the ACB for supply to exhaust fan if applicable, lighting of the substation and

Control supply for RMU etc. Necessary protection in incomer and outgoing shall be provided with MPCB/MCB as per the bus bar fault level.

1.63 **CSS-Factory Acceptance Tests.**

- Routine Tests as per Standard.
- Visual Inspection
- General Arrangement and Dimensional checks on Panel.
- Bill of Material verification.
- Earthing of cubicles and cubicle doors
- Insulation Resistance Measurement.
- One minute Power frequency voltage withstand.
- Functional checks with CB close/trip, interlocks, potential free contacts., Testing of Sequencing/Interlocking /Control / signals 100% test as per schematic drawing.
- Paint thickness measurement
- Milli Volt Drop Test for Busbar and joints.
- CT/VT Polarity tests.
- Metering and Protection CT circuit test with Primary Injection kit.
- Metering and Protection Relay circuit test with Secondary Injection Numerical relay kit.

1.64 **CSS-Packing and Transportation:**

a) **CSS is to be delivered in a protective cover. They are to be fitted with a lifting beam. Package substation dimensions shall allow 20-feet open top container transport. The size of the substation should be compact to meet the traffic and road transportation requirements.**

**b) Units are to be delivered fully assembled and equipped, only the concrete foundation slab and external cable connection are required on site.**

**Technical Specification for SCADA enabled RMU**

This Specification covers Design, Engineering, Manufacture, Inspection and Testing of HV Ring Main Units. The unit should be extensible on both sides for future requirement. The RMU to be supplied against this specification are required for installations where continuity of service is very important. The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years. Each RMU shall comprise the required numbers of the following types of modules.

a) Motorised Vacuum circuit breaker with three position disconnector and earthing switch downstream of the breaker + Protection Relay + Metering+ Current Transformer+ CVDI + FPI

b) Common Control Chamber with PT+ Aux Control Transformer +Battery + Charger

1.65 **RMU-Applicable Codes and Standards:**

a) The design, material, construction features, manufacture, inspection, testing and performance of equipment shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also

conform to the latest applicable standards. Nothing in this specification shall be construed to relieve the SELLER of this responsibility.

b) RMU shall be designed in accordance with following standards. It shall meet the all the parts and clause of the specified standards.

| **Standard** | **Description** |
|---|---|
| IEC 62271-100/200 | AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV |
| IS 3427 | AC metal enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV |
| IEC-61936-1 | Installation and Erection. |
| IEC-60529 | Degree of Protection |
| IS 12063 | Classification of degrees of protection provided by enclosures of electrical equipment |
| IS 9920 | High Voltage Switches |
| IS 9921 | Specification for AC disconnectors and earthing switches for voltages above 1000 V |
| IS 13118 | HV AC Circuit Breakers |
| IS 10601 | Dimensions of terminals of HV Switchgear and Control gear |
| IS 12729 | General requirements of switchgear and control gear for voltages exceeding 1000 V |
| IS 2705 /IEC 60185 | Current Transformers |
| IS 3156 / IEC 60186 | Voltage transformers |
| IS 3618 | Phosphate treatment of iron and steel for protection against corrosion |
| IS 5082 | Material for data for aluminium bus bars |
| IS 9046 | AC conductors of voltage above 1000V up to and including 11000V |
| IEC 6081 | Monitoring and control |
| IEC 1330 / IS: 14786/2000 | High voltage/Low voltage prefabricated substations |
| DIN 47636/IEC 60137 | Cable bushings |
| IEC 62271–1 | Common specifications for high-voltage switchgear and control gear standards |
| IEC 62271-102 | Alternating current disconnectors and earthing switches |
| IEC 62271-103 | Switches for rated voltages above 1 kV up to and including 52 kV |
| IEC-61243-5 | Voltage Detection System |
| IEC-62271-202-2014 | High-Voltage/Low-Voltage Prefabricated Substation |

RMU-Design Objective and Criteria:

a) RMU is to be designed for locations where space and safety is a concern, population density is high, such as urban centre.

b) RMU shall be Completely Factory built and tested, Modular & Compartmentalised, reinforced with specially designed ventilation system, with Superior Aesthetics, Convenience in portability, Ready to install & Commission, compact in size, Minimal maintenance, Suitable Outdoor locations, Tamper proof, completely safe for operators, SCADA enabled & ready to use with IISc-MRS SCADA system.

c) The RMUs shall be designed specifically for outdoor installation and, in this respect, shall be suitable for continuous operation in a tropical climate that includes exposure to severe frequently occurring thunderstorms. They shall

also be suitable for conditions in which they will be exposed to heavy industrial pollution, salt-spray, and high levels of airborne dust.

d) For continuous operation at specified ratings temperature rise of the various Switchgear components shall be limited to permissible values stipulated in the relevant standard and / or this specification.

e) The equipment in the proposed outdoor RMU shall be conformably coated to meet these climatic conditions. In this respect, standards such as IEC 60870-2-2 covering equipment, systems, operating conditions, and environmental conditions shall apply along with IEC 60721, which covers the classification of such conditions. In particular, the RMU equipment shall have been type tested for continuous operation under the environmental conditions.

f) The RMU shall be designed to have a fully enclosed metal housing combined with the single-phase insulation of all primary live parts to reduce the risk of internal faults to an absolute minimum and to provide a high degree of safety as well as availability. Nevertheless, manufacturer standard designs shall be used to the fullest extent possible.

g) Minimum Insulation of Equipment: The RMUs shall be of SF6 gas-insulated type. Otherwise, from an insulation perspective, the RMU shall be designed so as to minimize exposure to electrically live terminals when visual inspection or maintenance of the internal components is being conducted.

h) The SF6 gas shall comply with IEC 376,376A and 376B and shall be suitable in all respects for use in RMUs under the stipulated service conditions. The SF6 shall be tested for purity, dew point, air hydrolysable fluorides and water content as per IEC 376, 376A and 376B and test certificate shall be furnished to the IISc indicating all the tests as per IEC 376 for each lot of SF6 Gas.

i) With respect to the RMU's SF6-filled equipment, any accidental overpressure inside the sealed chamber shall be limited by the opening of a pressure-limiting device in the enclosure so that the gas will be released away from the operator without endangering the operator or anyone else in the vicinity of the RMU.

j) It shall include, within the same metal enclosure, earthing switches for Series Isolator and Circuit Breaker

k) Suitable fool-proof interlocks shall be provided to the earthing switches to prevent inadvertent or accidental closing when the circuit is live and the concerned Circuit Breaker is in its closed position.

l) Stain less steel tank enclosures filled with gas at suitable pressure to ensure adequate insulation and safe operation shall be used. The assembly shall not require further gas processing during its expected operational life of 30 years as per Clause GG 2.3 and 3.3 of IS 3427.

m) The degree of protection required against prevailing environmental conditions, including splashing water and dust, shall be not less than IP 54 for Outdoor RMU as per IS 12063.

n) The active parts of the switchgear shall be maintenance free. Otherwise, the RMU shall be of low-maintenance type. The tank shall be made of an adequate thickness of stainless steel and shall be internally arc tested.

o) The RMU shall be suitable for mounting on its connecting cable trench.

p) The positions of the different devices shall be clearly visible to an operator when standing in front of each enclosure with its door open. Device operations shall be clearly visible.

q) The RMU design shall be such that access to live parts shall not be possible without the use of Constructor-supplied tools.

r) The design shall incorporate features that prevent any accidental opening of the earth switch when it is in the closed position. Similarly, accidental closing of a

Circuit Breaker shall be prevented when the same is in an open position. This includes protection against accidental closing resulting from the release of any latch or spring in tension due to vibrations caused externally or internally.

s) All manual operations shall be carried out from the front of the RMU. The effort required to be exerted on the lever as used by the operator shall not exceed 250 N.

1.66 RMU Circuit Breaker Specification

a) The Circuit Breakers shall be maintenance free and, when standing in front of the RMU with enclosure doors open, their positions shall be clearly visible. The position indicator shall provide positive contact indication in accordance with IS 9920. In addition, the manufacturer shall prove the reliability of indication in accordance with IS 9921: Alternating Current Disconnectors (Isolators) and Earthing Switches for Voltages above 1kV.

b) The breakers shall have three positions (or states), i.e., Open, Closed, and Earthed, and shall be constructed in such a way that natural interlocking prevents unauthorized operations. They shall be fully assembled, tested, and inspected in the factory. An operating mechanism shall be used to manually close the Circuit Breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping. There shall be no automatic reclosing. The Circuit Breaker shall be capable of closing fully and latching against the rated making current. Mechanical indication of the OPEN, CLOSED, and EARTHED positions of the Circuit Breaker shall be provided.

c) When the Circuit Breaker closing mechanism is of the spring-operated type, it shall not be possible for the Circuit Breaker to close until the spring is fully charged and the associated charging mechanism is fully ready for closing. Wherever an external spring charging handle is required to charge the spring, it shall be ensured that the same is not allowed to move during release of the spring energy. Alternatively, it shall not be possible to release the spring energy until the charging handle is completely disengaged from the mechanism. A visual mechanical indicating device shall be provided to indicate the status of the spring, i.e., SPRING CHARGED or SPRING FREE. It shall be possible to charge the spring when the Circuit Breaker is closed and, if the spring is released, the Circuit Breaker shall not open. Nor shall this operation result in any mechanical damage to the component of the Circuit Breaker or its operating mechanism. Alternatively, a fast-acting reflex mechanism for Circuit Breakers is also acceptable.

d) The RMU shall be fitted with spring charge motors of insulation Class E or better allowing the circuit breakers to be operated without manual intervention. Motor speed shall ensure springs can be charged within 1 to 2 seconds. Independently of DAS control, the mechanism shall ensure that the motors start up immediately once the spring becomes discharged, so that the breaker becomes ready for the next operation. In addition to allowing circuit breaker tripping by the RMU's protection relays, the motorized operating mechanism shall be suitable for remote control by the SCADA.

e) The motors along with a bidder supplied control panel shall allow operating personnel to electrically operate the circuit breakers and load break switches at site without any modification of the operating mechanism and without de-energizing the RMU. The motors shall be of a reputable make in the form of a universal 24 V DC type. They shall be enclosed and completely dust proof and

sized with a suitable margin to meet the torque requirement of the spring charge mechanism.

1.67 The following accessories shall be provided on the panel front:

a) Operation counter.

b) Local / Remote selector switch for motorised operation.

c) Control switches / Push button for electrical local operation.

d) Local position indicators for circuit breaker, disconnector and earth switch.

e) Spring charge indicator.

f) Mano meter for SF6 tank pressure.

g) Mimic diagram with colour code as per IS 11954.

h) There should be fault passage indicator for all CB feeders. In case of fault current passing through that feeder the flag must indicate that the fault current has passed through it. There shall be provision of resetting the indication by providing a timer having adjustable time setting 1 to 4 hrs.

i) Protection System: The protection system should be provided with the provision of suitable self-powered relays having scheme for both over current & earth fault. It must provide immediate protection and can detect faults instructing the circuit breaker to trip in less than 40 ms.

j) The protection system is a self-powered relay which requires no external power source or batteries. It must have improved operation and Control with the Relay settings clearly displayed on the front of the panel.

k) It should have the provision for the trip test on circuit breaker. The 'trip inhibit' facility allows the Relay to be tested without tripping the circuit breaker. Secondary injection can also be carried out using conventional test equipment.

1.68 RMU-Common Unit for all feeders

l) Common Control Cabinet, to house the following, shall be similar in style and finish as the other RMU enclosures. This shall include having a minimum protection class of IP 54 for outdoor. It shall be tested in accordance with the latest IEC 60529 standard.

m) The cabinet shall have a hinged front access door with a three-point latch locking system and a latch operating lockable handle. The door shall be fitted with a perimeter flange and gasket (rubber or neoprene) to prevent the entrance of water. In addition, a means of monitoring and indicating that the door is open shall be provided.

n) The RMU shall be outfitted with a single-phase auxiliary power transformer with a turn ratio of 11000/sqrt (3) to 230 i.e., it shall be connected line-to-neutral to the RMU 11 kV bus and used to provide the required 230 V AC input to the RMU's power supply. The auxiliary power transformer shall have a capacity of at least 1,000 VA,

o) Three (3) potential transformers shall be provided. The burden per transformer shall be no more than 50 VA and the voltage ratio shall be 11000/110 V. The accuracy class shall be 0.5. HRC fuses shall be provided on the HV side.

p) The PTs shall be of cast epoxy-resin construction, and they shall conform to IS 3156. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.

q) Each RMU shall be outfitted with a power supply, including batteries and battery charger, suitable for operation of RMU. On this basis, the following operational

specifications shall apply: The power supply unit shall conform to the following requirements:

- Input: 230 V AC nominal from the RMU's auxiliary power transformer allowing for possible variations from 190 to 300 V AC, Output: Stable 24 V DC, - Batteries: 24 VVDC
- Receptacles: 2 x 230 V AC (for test equipment), Lighting Fixtures: One for each enclosure
- The auxiliary power transformer's inputs shall be equipped with surge protection devices Bus connected Surge Arrester (Oblum / Raychem make) in accordance with IEC 62305.

a) The 24 V DC batteries shall have sufficient capacity to supply power to the following devices with a nominal backup of 4 hours: RMU's spring-charge motors for a minimum of six (6) operations, RMU's trip coils, close coils, FPI, multifunction meters, and relays.

b) The batteries shall be of sealed lead acid VRLA or dry type and shall have a minimum life of five (5) years at 25oC. The battery charger shall be fully temperature compensated. To prevent deep discharge of the batteries on loss of AC power source, the battery charger shall automatically disconnect all circuitry fed by the batteries following a user-adjustable time period or when the battery voltage falls below a preset value. If the battery voltage falls below the preset value, the time to fully recharge all batteries shall not exceed twenty-four (24) hours. An automatic battery checking device shall be provided to check the battery's health and initiate a battery-failed alarm signal in case battery deterioration is detected. Such detection may be based on comparing measurement values with set values (e.g., internal resistance, voltage, etc.). The battery charger shall be provided with an alarm displayed at the local control panel and remotely at the DAS to account for any of the following conditions, Viz Low battery voltage, High battery voltage, Battery failed, Battery charger overvoltage, Grounded battery/battery-charger, Others according to manufacturer's design.

1.69 RMU-Earthing

a) There shall be continuity between metallic parts of the RMUs and cables so that there is no dangerous electric field in the surrounding air and the safety of personnel is ensured. The RMU frames shall be connected to the main earth bars, and the cables shall be earthed by an Earthing Switch having the specified short circuit making capacity.

b) The Earthing Switch shall be operable only when the main switch is open. In this respect, a suitable mechanical fail-proof interlock shall be provided. The Earthing Switch shall be provided with a reliable earthing terminal for connection to an earthing conductor having a clamping screw suitable for the specified earth fault conditions. The Earthing Switch shall be fitted with its own operating mechanism. In this respect, manual closing shall be driven by a fast-acting mechanism independent of the operator's action.

1.70 RMU-Cable Termination

a) Bushings shall be conveniently located for working with the specified cables and shall allow for the termination of these cables in accordance with the prevailing

practice and guidelines of cable manufacturers. The dimensions of the terminals shall be in accordance with IS 10601.

b) A non-ferro-magnetic cable clamp arrangement shall be provided for each cable to be terminated in the RMU. Special clamps to avoid mechanical load of the terminated cable on the bushing.

c) A suitable arrangement for the Circuit Breakers, Earthing Switches, and Load Break Switches shall be provided so that these devices can be padlocked in the "Open" and "Closed" positions.

d) A permanent "Live Cable" indication as per IEC 61958 (High-Voltage Prefabricated Switchgear and Control Gear Assemblies - Voltage Presence Indicating Systems) shall be provided for each cable using a capacitor voltage divider.

e) It shall be possible to test the core or sheath insulation of the cables without de-energizing the remaining section of the RMU, accessing the cable compartment, or disconnecting the cable.

f) Testing of Cable- without opening the doors. lf doors are opened then earth switch shall be in closed position and cable test rod shall be provided which can be fixed on terminations for testing purpose and it shall not be possible to operate, E/Switch or CB

1.71 **RMU Technical Data.**

| SN | Description / Parameter | Value |
|---|---|---|
| 1) | Project Information | Enclosed |
| 2) | Site Environment condition | Enclosed |
| 3) | Electrical System Parameters | Enclosed |
| 4) | Circuit breakers (CBs) also known as Vertical Lines (VLs) No of Ways/ Qty | **4 way / Nos or as per BOQ.** |
| 5) | Application: | |
| | **a) Loop In-Loop Out** | **Two numbers of Circuit Breakers only**. It is design intent to use CB with protection relay for Fault discrimination and Remote operation. |
| | **b) To feed-Tee Off** | Transformer in the CSS |
| | **c) Spare-Loop in out or Tee off** | For Future use. |
| 6) | **RMU Type** | |
| | a) Indoor / Outdoor | In CSS Enclosure. Vendor to decide. |
| | b) Degree of Protection | IP54 for Enclosure, IP3X with Front Cover opened & IP67 for SF6 Gas Vessel (HV Part) |
| | c) SF6 Tank Design | Hermetically/roboticall y sealed un painted **stainless steel enclosure** with SF6 Gas,so that norefilling of gas is required for 30 years. |

| | | |
|---|---|---|
| | d) SCADA | Enabled with Relay IEC-61850 Communication port. |
| | e) Extensible/Non-Extensible | **Extensible** |
| | f) Local / Remote Operation | Required |
| | a) Common Control Chamber | Required with Potential, Transformer, Aux Power Transformer, Battery and Charger |
| 7) | **RMU Construction** | |
| | a) CRCA sheet thickness for outer enclosure | 2 mm |
| | b) Stainless Steel sheet thickness for SF6 gas tank | 3mm, SS 304. |
| | c) Painting | Pre-treatment & painting as per 7 tank process Epoxy Polyster Resin Based Powder |
| | d) Material of Main Busbar system | High conductivity electrolytic grade **Copper** |
| | e) Extension of earth busbar outside the RMU | To be provided on both sides |
| | f) Base frame for mounting | To be provided |
| | g) Pressure Relief Device | Required. |
| 8) | Accessibility to compartments | |
| | h) Busbar compartment | Non-accessible |
| | i) Switching-devicecompartment<br>j) | Non-accessible |
| | k) Cable compartment for panels | **Interlock-controlled** |
| | l) Metering panels and LV chamber | Tool-based |
| 9) | **RMU Parameters** | |
| | a) Voltage | 11kV |
| | b) Rated Bus Bar Current | **630 Amps (rms)** |
| | c) Insulation, Insulation at joints and tap-offs | SF6 |
| | d) Fault Level and Short Time Rating | **21kA for 3 Sec** |
| | e) Power Frequency Withstand Voltage to Earth, Between Poles, & Across Opening Span<br>f) Across Isolating Distance | 28 kV rms for 1 minute<br>32 kV rms for 1 minute |
| | g) Basic impulse withstand voltage Phase-to-Phase & Phase-to- Earth: Across Isolating Distance | 75 kV<br>85 kV (peak) |
| | h) Partition Class | PM (Partition of Metal) |

| | | |
|---|---|---|
| | i) Loss of service continuity category for modules | LSC 2 |
| | j) Internal arc classification-Ventilation downwards or upwards **shall be co-ordinated with Compact substation design**. | IAC AFLR up to 25kA 1s or IAC- A AFL 20kA 1sec. |
| | k) Temperature Rise | As per Table 3 of IEC 60694 |
| 10) | **Circuit Breaker Parameters** | |
| | a) Rated CB Current | **630**A (All ways) |
| | b) Rated Feeder Current | **630A**(All ways) |
| | c) Rated network load and closed-loop breaking current | **630**A (All ways) |
| | d) Rated no-load cable-breaking current | *** Amps (Vendor to provide) |
| | e) Insulation Medium | SF6 Gas |
| | f) Arc Quenching Medium | Vaccum |
| | g) Rated Operating Sequence. (Remote / Manual Operation) | **O–0.3s–CO–3 min–CO** |
| | h) Rated Short Time withstand current Ik | 21kA for 3 Sec |
| | i) Rated Cable Charging current | **60A** |
| | j) Rated Peak withstand current Ip | 52.5kA. |
| | k) Rated Short circuit breaking current Isc | 21 kA |
| | l) Rated Short circuit making current Ima | 52.5kA. |
| | m) Operating Mechanism | Spring-operated / stored-energy mechanism-Motor and Manual spring charging. |
| | n) Rated no. of operating cycles, mechanical /classification | 2000/M1 |
| | o) Rated no. of operating cycles, Electrical at rated normal current classification | 2000/E2 |
| | p) Classification | E2, C**, M1, S** |
| | q) Numbers of short circuit breaking operations n | **Up to 20** |
| | r) VCB Opening Time | ** ms |
| | s) Arcing Time | ** ms |
| | t) Breaking Time | ** ms |
| | u) Series Trip Coil | Required.3 V DC |
| | v) Shunt Trip Coil | 24 VDC |
| | w) Spring Charging Motor | Required, 24VDC |
| | x) TNC Switch for CB ON/OFF | Required |
| | y) Local Remote switch | Required |
| | z) Aux Switch | Required |

| | | |
|---|---|---|
| 11) | Three Position Switch (Connected in series with VCB) | |
| | a) Rated Current | 630 A |
| | b) Rated short circuit making current Ima | 52.5 kA |
| | c) Rated no. of operating cycles, mechanical at no<br>d) load/classification | 1000/M0 |
| | e) Rated no. of operation at short circuit making current Ima<br>f) for earthing switch/classification | 5/E2 |
| | g) Manual Operation of Three Position Switch, | TPS<br>ON /OFF, E/SW ON/OFF |
| | h) Blocking Coil for Earth Switch | Yes, as per design requirement. |
| 12) | SF6 Gas Pressure Monitoring | |
| | a) Type of SF6 gas monitoring | Ready for Service Indicator with 1 NC Contact |
| | b) Nos. of Manometers | 1 No per SF6 Vessel |
| 13) | **Protection** | |
| | a) Protection Relay with Voltage, Current based protection functions, measurement function and, status monitoring and control functions, IEC **61850 Ethernet** communication port | Required for all CB feeders. **GE-P14DB** |
| | b) CT Loop Self-Powered Overcurrent and E/F Relay connected to series trip coil. | Required. Backup protection to above main relay in the event of 24vdc fail. |
| | c) Epoxy resin cast CTs for Protection: | Burden: **VA<br>Ratio: 400-200/**1-1 A**<br>Accuracy Class: 5P** |
| 14) | **Metering** | |
| | a) Multifunction/ Load Manager / Power Quality Meter-Cl 0.5 with, Maximum kVA Demand Indication, Phase Sequence Indication, Total Harmonic Distortion RS-485 Modbus communication port | **Required for all CB feeders.** Secure / Equivalent make. |
| | b) Epoxy resin cast CTs for Metering: | Burden: 2.5VA,<br>Ratio: 400-200/**1-1 A,**Class: 0.5 |
| 15) | **Indications.** | |
| | a) Capacitor Voltage dividers serving live-line cable indicators (CVI) | **Required for all CB feeders** |

| | | |
|---|---|---|
| | b) Fault Passage Indicator (FPI) | **Required for all CB feeders** |
| 16) | **Termination Arrangements** | |
| | a) Cable Termination and Gland Plate facility. | 11kV, 400 Sqmm, Al, XLPE Armoured Cable |
| | b) Power cable entry from | Bottom |
| | c) Control cable entry from | Bottom |
| | d) HV Terminal Cable Boots | Required, Right Angled, Re-Usable. |
| **17)** | **Interlocking Arrangement** | |
| | a) Provision for Key Interlocking | Required |
| | b) Provision for Pad locking of CB and Isolators, Earth switches | Required |
| | c) Cable cover standard with Interlocking | Required |
| 18) | **Others** | |
| | a) CB Operation counter | Required |
| | b) Emergency Trip Button | Required |
| | c) Mimic on cover | Required |
| | d) Danger Label | Required |
| | e) Operating Handle | Required |

1.72 Specification for 11kV Feeder Protection Relay

Feeder Protection relays intended to be provided in 11kV RMU system shall meet following minimum requirements.

- Compact design for power distribution applications featuring universal communications, ideal for on-switchgear installation, as the same needs to be fitted in RMU.
- High I/O density – up to 14 inputs / 9Outputs, Heavy duty control output relay, in a case as small as 4-inch width, all these I/O shall be wired and mapped to IEC-61850 for remote monitoring and control.
- Draw-out design for simplified testing, commissioning, and maintenance.
- Suitable for application in solidly-grounded, through to systems with constrained fault currents, such as resistance/ impedance grounded systems.
- Networks with connected renewables requiring advanced harmonic monitoring and accurate recording.
- Standard, coastal, industrial, and polluted environments thanks to harsh environmental coating of PCBs as standard.
- Comprehensive 50, 51, 50N, 51N, 67. 67N 50BF, 27 & 59, Over Current/ Earth Fault Directional Over current and earth fault, Voltage, Power and Frequency protection functions. Advanced Monitoring and Metering with THD upto 21st order.
- Supports IEC 61850 Ed. 2, IEC 62439 (PRP/ HSR), Modbus RTU, Modbus TCP, IEC 60870-5-103,
- All the CB and Switches status and control shall be wired to this Numerical Multifunction Relay which shall act as composite protection, indication, metering,

Remote Terminal Unit, to be integrated with IISc-MRS IEC-61850 based substation SCADA.

- Contact Multiplying Relays (CMRs) are required to multiply the contacts of breaker, isolators and protection relays etc. The contacts of these relays shall be used to provide status inputs to the Relay.
- Time facility: The internal Relay time base shall have a stability of 10 ppm. The RTU shall be synchronised through synchronisation message from master station at every 5 minutes (configurable from 5 minutes to 60minutes) over IEC 60870-5-104/NTP/SNTP.

1.73 RMU-Remote Monitoring and Operation from SCADA.

Following Status/command signal shall be wired up to Protection relay Digital Input and Outputs and configured so that remote monitoring and operations is feasible over the IEC-61850 Communication port.

a) Monitor and control the open/closed status of the RMU circuit breakers, monitor for circuit breaker relay operations Monitor circuit breaker spring charge (switch readiness) status.

b) Monitor the health of the power supply, which will include battery failure and low voltage indications.

c) Monitor the number of operations of the RMU's circuit breakers.

d) Monitor the open/closed status of RMU Isolator+ Earthing switches.

e) Monitor the open / closed status of RMU enclosure doors.

f) Monitor the status of Fault Passage Indicators.

g) Monitor for low SF6 gas pressure readings.

h) Monitor voltage, current, power, energy, and power factor values corresponding to the RMU's main circuits and the phase currents corresponding to feeders. Harmonics and THD up to the 21st order.

1.74 Type Tests for RMU

The type test reports/ certificates of the below mentioned tests shall be supplied for approval before offering the material for inspection. The details of type test certificate

according to the composition of the Switchboard shall also be submitted with the offer. Following shall constitute the type tests:

a) Lightening impulse test with CB in cubicle

b) Power Frequency Voltage Test

c) Temperature Rise Test with CB in cubicle

d) Measurement of Circuit Resistance

e) Rated Short Time and Peak Current Withstand test for main and earth circuit.

f) Breaking and Making Capacity Test for Breaker &isolation Switches

g) Operational &interlock Performance Test

h) Internal Arc Withstand Test.

i) Degree of Protection (lP Code verification tests)

j) Mechanical Endurance Tests for lsolator and Breaker.

k) Pressure withstand test & Leakage test on SF-6 Gas chamber.

l) Dimensional and Visual Checks.

m) Checking of partial discharge on complete unit.

1.75 Routine tests:

The following routine tests shall be conducted by the manufacturer and the same shall be backed by the factory's quality control department test reports.

a) Power Frequency Withstand Test.

b) Dimensional & Visual Checks

c) Operational & Interlock Tests of breaker & isolator switches

d) Measurement of Circuit Resistance

e) SF-6 chamber pressure withstands/leakage test.

f) HV withstand test across isolator distance.

g) HV withstand test of control and auxiliary circuits.

h) Voltage indication Tests.

i) CB Contact Resistance Test.

j) Test to check the total time taken to clear the faults (relay pick up+ Trip coil pick up +breaker trip) for instantaneous & time delay modes under various settings of relay and trip coil through primary current injection.

k) IR Value

l) Partial Discharge measurement.

Below routine test has to be provided on cable Boot for cable termination:

a) Visual inspection of the final finished product.

b) Intactness with Bushing.

c) Insulation Test.

d) AC HV test

1.76 Acceptance tests:

All the tests specified under Routine Test Clause above shall be carried out as acceptance test on random samples as per sampling plan under IEC/IS for each lot.

ln addition SCADA operation of RMU along with PROTECTION RELAY-IEC-61850 communication should be demonstrated during factory inspection in manufacturer's factory failing which the supplies shall not be accepted.

Note: Bidder should have all the requisite testing equipment's to carry out routine and acceptance test mentioned above including:

a) Facility for primary current injection up to 1000 Amp.

b) Facility to check total trip timing of breaker along with breaker main contacts through primary current injection.

1.77 Pre-commissioning test

Pre-commissioning test to be conducted on each RMU before installation and commissioning are as under.

a) IR Value.

b) HV test (AC).

c) Primary injection with timing of breaker including relay and CT circuit.

d) Contact resistance.

Technical Specification-Resin Cast Dry type Power Transformer.

1.78 Transformer Design Consideration in general shall be as follows:

a) 11KV/ 433volt distribution transformer shall be a part of packaged substation which will be housed in the enclosure having natural ventilation.

b) Rating: The transformers shall be capable of continuous operation of rated output under the operating conditions of voltage and frequency variations, at any of the specified tapping position and with the maximum temperature rise specified as per statutory limits governed by relevant Indian Standard and Central Electricity Authority Regulations / IEC with latest amendments in force.

c) System Neutral and Transformer Neutral: The 11kV side source and L.V. neutral is earthed solidly at each transformer substation. The transformers will be connected in a system consisting of both overhead and underground mains (both on HV and LV sides).

d) Type of Load: Industrial/Lab/Domestic Loads viz, Motor and HVAC, VFD, LED Lighting and UPS Loads.

e) Transformers shall be of two winding, shall be Cast Resin, self-cooled and shall comply with the requirements of relevant standards. Transformer shall be complete with all necessary accessories as specified herein below.

f) Transformers shall be capable of sustaining a short circuit on any winding with the fault power being maintained, without any damage to any part of the transformer for the period given in IS:2026. Calculation shall be submitted along with the offer to prove that thermal as well as mechanical withstand capacity of

the transformer is as per Indian Standards in the event of short circuit to the specified duration.

g) The impedance of the transformer shall not be less than as stated in IS at a reference temperature of 75 deg. C.

h) Transformer shall be capable of carrying its full normal rated current continuously at any tapping under worst temperature encountered.

i) Transformers shall be connected as specified in design requirements. Winding shall comprise high conductivity copper conductors fully insulated and shall be suitable for the highest system voltage.

j) The transformers shall be free from annoying hum or vibration. The design shall be such as not to cause any undesirable interference with radio or communication circuits.

1.79 Transformer Winding details

a) Winding shall be concentrically wound on the core, and shall be braced to withstand shocks, which may occur through rough handling during transport, switching and other transient condition during service, and also to reduce to a minimum the damage arising from stresses due to an internal fault. All windings shall be subjected to vacuum drying.

b) The conductor for transformer HV and LV windings and their insulation shall be such as to ensure uniform distribution of the voltage surges among all the coils of the windings.

c) The windings shall be provided with Class-F epoxy resin cast insulation. The insulation shall have high tensile and dielectric strength. Enough measures shall be taken during casting to avoid the void formation, cracking and crazing etc. of the cast coils.

d) Both HV and LV windings of each phase shall be separately cast on rigid tubular coil co-axially arranged under vacuum in to casting moulds. The epoxy resin insulation system shall be fibre glass strengthened.

e) The resin used for winding insulation shall be non-hygroscopic to prevent the penetration of moisture into windings. It should be possible to energize the transformer without pre-drying even after a long period of service interruption. The resin used shall be non-inflammable, self-extinguishing, void free and suitable for tropical climate with 100% relative humidity. In the case of windings provided with taps, the inter-turn insulation of tapped windings shall be reinforced to obtain uniform stress distribution. No filler materials are allowed to use in Resin Mixture.

f) The transformer shall be able to withstand short circuits as well as switching and lightning/atmospheric impulse voltages as specified in the IS 11171 standard. The leads and connections shall be mechanically strong and adequately brazed to withstand short circuit forces and transportation shocks.

g) The LV neutral terminal of the star connected winding shall be brought out at two separate insulated terminals. One neutral terminal shall be provided by side of the phase terminals for connecting neutral to neutral bus-bar in the LV termination box. Second neutral terminal shall be provided to facilitate the earth conductor down to the ground level. The terminal shall be suitable for connecting two numbers of earth conductors (for neutral earth connection with two separate earthing pads.

h) Off circuit tap changing link shall be provided with total tapping range as specified in TDS. The tapings shall be on high voltage side. The transformer

shall be capable of delivering its rated output at any tap position without damage.

i) Off circuit tap changing link shall provide for a voltage adjustment on H.V side from +5% to -10% in steps of 2.5% each (6 steps / 7 positions) to obtain rated voltage of 433 volts on LV side.

1.80 Transformer Support Insulators and Terminals

a) Support insulators shall be designed and tested to comply with the applicable standards.

b) HV terminals rated for minimum current 400 A shall have non-ferrous and non-magnetic flanges and hardware.

c) Air clearance and creepage distances shall be maintained as per the relevant standard.

d) Preferably the material for support insulators shall be Porcelain or epoxy resin cast.

e) Temperature of the primary and secondary terminal shall not exceed 90Deg C.

f) Transformer primary terminal shall withstand primary system fault level for 0.25Sec, Secondary terminal shall withstand through fault current for 2 sec.

1.81 Transformer Core

a) Transformer shall withstand, without injurious heating, combined voltage, and frequency fluctuation, which produces the over fluxing condition.

b) Cores shall be built from best quality, low loss, cold-rolled, grain oriented electrical steel laminations conforming to IS:8322 or approved equivalent. All core sheets shall be to reduce the core loss to a minimum.

c) Material to be used for the transformer core shall be made of premium grade Imported Cold Rolled Grain Oriented (CRGO) M4 or better with high grade, non-ageing, low loss and high permeability cold rolled grain-oriented silicon steel laminations. Only those bidders who directly imported CRGO either from the manufacturer or through their accredited marketing organization of reputed (and not through any agent) shall be considered. In support of this requirement the bidder shall submit an undertaking in specified format (schedule C) in the form. The CRGO shall be cut at authorized Processing unit only.

d) Lamination thickness should be maximum 0.27 mm with insulation coating on both sides.

e) Flux density should not exceed 1.5 Tesla at rated voltage and frequency. Flux density should not exceed 1.9 Tesla at 112.5 % of rated voltage and frequency.

f) The design of the magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux component at right angles to the plane of laminations which may cause local heating.

g) The Core design shall be compact with least possible air gap and rigid clamping for minimum core loss and noise generation.

h) Core shall be adequately braced to withstand bolted faults on secondary terminals without mechanical damage and displacement during transportation and positioning.

i) All steel sections used for supporting the core shall be thoroughly sand blasted after cutting, drilling and welding.

j) All joints shall be inter leaved and the core shall be securely clamped so as to ensure that the noise level and the vibration are maintained at a minimum. All

clamps shall be adequately insulated. Adequate fitting shall be provided for lifting the core from the tank.

k) The bidder shall provide saturation curve of the core material proposed to be used and calculations.

l) The framework and clamping arrangements shall be earthed.

m) Insulation of Core to bolt and core to clamps shall be able to withstand a voltage.

n) The core shall be bolted to the bottom plate of the tank secularly.

o) The cast coils are inserted on to the core limbs. The resin cast spacer blocks, end blocks and separators shall be used as required. The coils should be placed on the anti- vibration insulation materials.

p) The successful bidder shall be required to submit the manufacturer's test report showing the Watt Loss per kg and the thickness of the core lamination, to ascertain the quality of Core materials.

q) The IISc reserves the right to get sample of the core material tested at any Government recognized laboratory.

r) Magnetic circuit shall be bonded to earth system, All internal metal parts of the transformer, with the exception of individual laminations, core bolts and their individual clamping plates shall be earthed inside the tank by copper strap connection to the tank.

s) Temperature Sensor and Winding Temperature Indicator (WTI)

t) Temperature sensors: Two (2) numbers, reputed make simplex type (Platinum) PT 100 shall be provided in each phase at suitable place for measuring hot spot temperature.

u) A multi-channel digital winding temperature indicator shall be provided to display the temperature of the windings with Alarm and Trip Contacts.

1.82 **Transformer Technical Data:**

Note: ** = Bidder to Indicate the values

| **Sl. No** | **Description** | **Data** |
|---|---|---|
| 1) | **General Data** | |
| | a) Application | Power Distribution for Industrial/Lab/Domestic Loads viz, M**otor and VFD, LED Lighting and UPS** Loads |
| | b) Site conditions | As per Enclosed Project Information |
| | c) Quantity | As per enclosed Price BOQ |
| | d) Maker's name | Bidder to indicate |
| | e) Country of manufacture | India. |
| | f) Manufacturer's type and designation | ** |

| Sl. No | Description | Data |
|---|---|---|
| | g) Applicable standards | IS-2026, IS-11171 As per enclosed Price Schedule |
| | h) Installation (outdoor / indoor)/Containment of Transformer. | Totally enclosed in CSS Enclosure with Natural Ventilation only. |
| 2) | **HV Side Source Electrical System Data** | |
| | a) System voltage-Nominal | 11 kV +/- 10% |
| | b) System voltage-Highest | 12 kV |
| | c) Voltage variation | 10 % |
| | d) System frequency | 50 Hz +/- 3% |
| | e) Frequency variation | 5 % |
| | f) System fault level | 21 kA |
| | g) Fault Duration | 1 S |
| | h) System neutral earthing | Solid |
| 3) | **Rating Data** | |
| | a) Type | • **Dry Type,**<br>• **Resin Cast**<br>• **Primary and Secondary Copper Wound** |
| | b) Rating | **To provide output of 800kVA inside CSS Enclosure with Natural Ventilation and K* Rated enclosure. OEM to co-ordinate with CSS packager.** |
| | c) Type of cooling | ANAN as per CSS design. |
| | d) Rated voltage primary winding | 11 kV |
| | e) Rated voltage secondary winding | 0.433 kV-No Load |
| | f) Rated frequency | 50Hz |
| | g) Number of Phases | 3 |
| | h) Rated current-HV | ** Amps |
| | i) Rated current-LV | ** Amps |
| | j) Percentage impedance at Principal tap at Rated MVA with Tolerance | **As per ECBC-2017** |
| | k) Insulation-HV Winding | **Class-F or better** |
| | l) Insulation-LV Winding | **Class-F or better** |
| | m) Insulation | Uniform-Fully insulated |
| 4) | **Specific Requirement** | |
| | a) Type of Loads, Motor, VFD, HVAC, UPS, LED Lighting, PC Workstations. | *** Bidder to Confirm |
| | b) Partial discharge. | <10 pc /as per IS-11171 |
| | c) Loading requirement as per Standard | Continuous Loading with occasional momentary overload. |
| | d) Temperature Monitoring | RTD Shall be provided 2Nos per winding. |
| | e) Switching surges and lightning over voltages | Design shall dampen the electrical oscillations to |

| Sl. No | Description | Data |
|---|---|---|
| | | which transformer may subjected to. |
| | f) The effect of harmonic distortions | Shall be immune to the same |
| 5) | **Noise Level** | 64 dBA At 30 cm distance. |
| 6) | **Power Flow** | HV to LV |
| 7) | **Winding Connection** | |
| | a) Primary winding connection | Delta |
| | b) Secondary winding connection | Star |
| | c) Vector Group | Dyn11 |
| | d) Neutral Bushing | Required |
| 8) | **Conductor Current Density** | |
| | **a)** HV Winding | **A/Sq. mm |
| | **b)** LV Winding | **A/Sq. mm |
| 9) | **Maximum flux density in iron** | |
| | **a)** at 100% rated voltage | 1.5 Tesla |
| | **b)** at 110% rated voltage | **Tesla |
| 10) | **Tap Changer Data** | |
| | a) Type of Tap Changer | OCTL |
| | b) Taps to be Provided on | HV for HV variation |
| | c) In Positive | 5 % |
| | d) In Negative | **10 %** |
| | e) Step size | 2.5 % |
| | f) No. of steps | 6 steps, 7 Position. |
| 11) | **Details of Materials for** | |
| | a) Primary Winding | **Electrolytic Copper** |
| | b) Secondary Winding | **Electrolytic Copper** |
| | c) Winding Insulation-Primary | **Resin Casted** |
| | d) Winding Insulation-Secondary | **Resin Casted** |
| | e) Core Material | CRGO M4 or better |
| 12) | **Terminal Arrangement** | |
| | Primary | Pad for HT Cable. |
| | Secondary | Pad for LV Busbar |
| 13) | Over Voltage operating capability & duration | |
| | a) 110% of rated voltage | Continuous |
| | b) 125% of rated voltage | 60 Sec |
| | c) 140% of rated voltage | 5 Sec |
| | d) 170% of rated voltage | Bidder to Indicate |
| | | |
| 14) | Temperature Rise Data | |
| | a) Reference ambient temperature | **43.3 deg C as per Site condition.** |
| | b) By Winding by resistance over the ambient. | **90deg C, Limited to Class B Temperature** |
| | c) Limit of Hotspot Temperature with avg. Ambient temperature. | ** |
| | d) Maximum Hot Spot Temperature | ** |
| 15) | **Power Frequency Withstand-Voltage** | |
| | a) HV | 28kV |
| | b) LV | 3kV |
| 16) | **Impulse Withstand-Voltage** | |
| | a) HV | 75kV |
| | b) LV | 8kV |

| Sl. No | Description | Data |
|---|---|---|
| 17) | Clearnce and Creepage | |
| | a) Clearnce-Phase to Phase | As per IEC/CBIP |
| | b) Clearnce-Phase to Earth | As per IEC/CBIP |
| | c) Creepage | As per IEC/CBIP |
| 18) | **Losses Data** | |
| | a) Total Losses at 50% load | As per ECBC-2017 |
| | b) Total Losses at 100% load | |
| 19) | **Efficiency Data;** at 75 °C | |
| | a) 100% Load | ** |
| | b) 75% Load | ** |
| | c) 50% Load | ** |
| | d) 25% Load | ** |
| | e) Load & PF at which maximum efficiency occurs in terms of % Full Load | ** |
| | f) Maximum Efficiency | ** |
| **20)** | **% Regulation at full load at 75 °C at** | |
| | a) At UPF | ** % |
| | b) At 0.8 PF | ** % |
| **21)** | **Other Accessories** | |
| | a) Earthing terminals | Preferably PADS |
| | b) Base Channel | Mild Steel |
| | c) Lifting and Pulling Lugs | Mild Steel |
| | d) Wheels | Mild Steel |
| | e) Rating Plates | Stainless Steel |
| | f) Hardware /Fasteners | Stainless Steel |
| | g) Marshalling Boxes | For RTD Cables |
| | h) Nameplates | stainless steel |
| | i) Terminal Marking Plates | Required |
| | j) Plain Rollers | Required with Locking Arrangement-Four Nos |

1.83 **Applicable Standards for Transformers**

| Item | Standards | |
|---|---|---|
| Power transformer | **IS 2026** | IEC 60076 |
| **Dry Type Power Transformers** | **IS 11171** | |
| Fittings & Accessories for Power Transformers | IS 3639 | IEC |
| Climate Proofing | IS 3202 | IEC |
| Guide for Loading of transformers | IS 6600 | IEC 60354 |
| Bushings | IS 2099 | IEC 60137 |
| Degree of protection | IS 2147 | IEC 60144 |
| Tests | IS 2026& IS 11171 | IEC 60076 |
| Tolerance on guaranteed particulars | IS 2026 | IEC 60076 |
| Thermal Evaluation and classification of electrical insulation | IS 1271 | IEC 60085 |

1.84 Transformer Routine Factory Acceptance Test

The following Routine Tests shall be performed.

a) Measurement of voltage ratio at all tap positions and

b) Check of voltage vector relationship

c) Measurement of winding resistance.

d) Insulation Resistance.

e) Measurement of impedance voltage (principal tap), short circuit impedance and load loss at rated current.

f) Measurement of no-load losses and current.

g) Induced over voltage withstand test.

h) Separate source voltage withstand test

i) Magnetic Balance Test

j) Partial Discharge Measurement.

k) Measurement of tanδ and capacitance of each winding to earth (with all other windings connected to earth) and between all windings, connected, to earth.

1.85 Transformer Special Test.

The following Special Test shall be performed as Witness test for one Typical Rating.

a) Temperature Rise test for 8Hrs of duration.

b) Measuring zero-sequence impedance

c) Noise level test

d) Measuring of harmonics of the no-load current

1.86 The following Type test reports shall be submitted.

a) Lightning impulse test

b) Temperature Rise test.

c) Measurement of acoustic noise level

d) Partial Discharge Measurement

e) Short Circuit Test

Specific Technical Requirements.

Ensuring the below requirement/co-ordination is the specific responsibility of Bidder.

1.87 **After Sales Service and support.**

a) CSS OEM/ Packager shall have **Local Authorised Service Centre / Office in Bangalore** to attend to Routine and breakdown maintenance calls.

b) Local service office shall maintain sufficient inventory of spares so that on time replacements can be provided minimising the down time.

a) Local service office shall also be accessible for Annual Maintenance contract later after defect liability period.

1.88 **CSS Foundation requirements.**

a) CSS Packager shall provide the complete recommended foundation plan and elevation drawings considering the static load, dynamic load, cable bending space, Opening for HT and LT Compartments, Ventilation cutouts for Transformer, operation, and maintenance space around the unit. Bidder shall take it further, perform load analysis with suitable software, soil analysis and submit the drawings to IISc approval before execution.

b) The Bidder at his own responsibility is encouraged to visit and examine the Site of Works, assessment of risks and hazards, contingency, and its surroundings and obtain each sub the foundation, its orientation, available space, alignment/ orientation and approach road etc.,

c) Bidder shall perform his assessment of site including soil survey, load bearing capacity & Electrical Soil resistivity.

1.89 **CSS Ventilation and cooling.**

CSS design shall consider the Solar irradiation at site along with Ambient temperature of the site. Ratings of Internal component's within the CSS **shall be based on the Natural Ventilation only. Ratings /design dependent on forced cooling are not acceptable.**

1.90 Ring Main Unit

a) All the ways specified for RMU in BOQ shall be Circuit breakers-CBs with 630A Rating It is design intent to have the Protection Relay operated tripping on all the ways including loop in loop out feeders to have fault discrimination for enhanced safety.

b) All CBs shall be Motorised with Local and Remote monitoring and Operation from SCADA.

c) RTU cum Protection Relay with Voltage, Current based protection functions, measurement function and, status monitoring and control functions, GE make P14DB, IEC 61850 communication port.

d) All the required accessories such as Aux Transformer, Battery, Charger, Power Pack, Control Cabinet shall be included as specified elsewhere in this document.

e) Numerical Relay Parameterisation, IED files, EDS files etc shall be shared after testing.

f) Relay communication and SCADA operation functions shall be simulated with IEC-61850 testing and simulating tools during FAT and SAT.

1.91 Protection Relay Setting and Co-Ordination

a) Calculation of all protection relay setting and co-ordination and discrimination with upstream and downstream relays, LV Side ACB/MCCB shall be done and submitted for approval and all the devices shall be parameterised during FAT and SAT.

1.92 Witness Inspection.

a) Before procurement and Assembly of CSS, bought out RMU and Transformer shall be offered for Witness Inspection at OEM factory. All the Routine /Type / Special tests will be witnessed by IISc or their Authorised Personnel.

1.93 Special Tools and Tackles:

Following minimum one Set for entire Contract, Special Tools and tackles, apart from OEM standard, are to be included in the main scope for Safe Installation, testing, commissioning, operation, and maintenance.

| S.No | Description | Qty |
|---|---|---|

| | | |
|---|---|---|
| a) | 11kV, Class-2, High quality Insulating mats conforming to Standards IEC 61111Portable Rubber Mat with carry Case(Raychem or equivalent make). | 2Nos |
| b) | 11kV, Class-2, High quality Insulating Hand Gloves (Raychem or equivalent make). | 2 Sets |
| c) | Arc Suit in Jacket + Bib + Hood Design-Free size, HRC -4, 40 Cal/Sq.cm (Type and specification shall be as per recommendation of RMU supplier) (Raychem or Equivalent make). | 2Nos |
| d) | SF6 Gas Leak Indicator make/model as per RMU manufacturer recommendation. | 1 No |

1.94 Interfacing of RMU with IISc-SCADA-Demo.

Bidder shall assist and demonstrate the integration of Protection Relay cum RTU over IEC-61850 communication. It shall include exchanging device setting files, pinging command over LAN network, Pining command from Remote SCADA PC.

1.95 Training: Bidder/Packager/OEM shall give training to 5 persons for 3 days on operation, configuration, trouble shooting of all the Protection relay, RMU accessories and auxiliary equipment to IISc Engineering/O&M Personnel in IISc premise and also practical demonstration On-site.

1.96 COMPACT SUBSTATION – IO list: Following signal shall be wired up to relay terminals, programmed, configured and made available at the IEC-61850 communication port of each CB Feeder protection relay cum RTU

| **GE-P14DB Relay** | **Digital Inputs** | | | |
|---|---|---|---|---|
| | **Loop In Feeder** | **Loop Out Feeder** | **Transformer Feeder** | **Spare Feeder** |
| DI-1 | CB Closed | CB Closed | CB Closed | CB Closed |
| DI-2 | CB Open | CB Open | CB Open | CB Open |
| DI-3 | CB Spring Charged | CB Spring Charged | CB Spring Charged | CB Spring Charged |
| DI-4 | CB Local/Remote | CB Local/Remote | CB Local/Remote | CB Local/Remote |
| DI-5 | E/S Open | E/S Open | E/S Open | E/S Open |
| DI-6 | E/S Closed | E/S Closed | E/S Closed | E/S Closed |
| DI-7 | Reserved#1 | Reserved#1 | Reserved#1 | Reserved#1 |
| DI-8 | Reserved#2 | Reserved#2 | Reserved#2 | Reserved#2 |
| DI-9 | Spare | Spare | Winding temp. Alarm | SF6 Pressure: Low |
| DI-10 | Spare | Spare | Winding temp. Trip | Charger AC: Fail |

| | | | | |
|---|---|---|---|---|
| DI-11 | Spare | Spare | Transformer compartment Door | Voltage DC: Low |
| DI-12 | Spare | Spare | Spare | LT Side Common Alarm |
| DI-13 | Spare | Spare | Spare | LT ACB ON/off |
| DI-14 | Spare | Spare | Spare | LT ACB Trip |
| | | | | |
| | **Digital Outputs** | | | |
| DO-1 | CB close | CB close | CB close | CB close |
| DO-2 | CB Open | CB Open | CB Open | CB Open |
| DO-3 | Reserved #3 | Reserved #3 | Reserved #3 | Reserved #3 |
| DO-4 | Reserved #4 | Reserved #4 | Reserved #4 | Reserved #4 |
| DO-5 | Spare | Spare | Spare | Spare |
| DO-6 | Spare | Spare | Spare | LT ACB Close |
| DO-7 | Spare | Spare | Spare | LT ACB Open |
| DO-8 | Spare | Spare | Spare | Spare |
| DO-9 | Spare | Spare | Spare | Spare |
| | **Analog data** | | | |
| Measurement | Voltage, Current, Power, Frequency, Energy as per Relay data | | | |
| Protection | All functions as per Relay data. | | | |

1.97 The makes as specified in the BOQ and /or below mentioned makes of components are acceptable. Any other make if offered shall be subject to IISC's approval:

1.98 Product of identical specification and rating shall be interchangeable during assembly stage or in site later during installation, commissioning operation and Maintenance time for the ease of inventory and minimise the down time. Makes/model of the major components shall be same across all the equipment.

| SN | Description | Approved Makes |
|---|---|---|
| 1. | Compact Substation (CSS) | ABB / SIEMENS / SCHNEIDER/ L&T / VOLTAMP /KIRLOSKAR / BANAVATHY. |
| 2. | 11kV Ring Main unit including Control Chamber. | SIEMENS / SCHNEIDER / EATON/ABB |
| 3. | 11kV Feeder Protection Relay with IEC-61850 communication port | GE (Model noP14DB) |
| 4. | 11kV Potential and Control Transformer | KAPPA / PRAGATHI / RMU OEM Approved vendors. |
| 5. | Dry Type Cast Resin Distribution Transformer | KIRLOSKAR/ VOLTAMP / HITACHI / RAYCHEM |
| 6. | 11kV HT Cable | KEI / POLYCAB / HAVELLs / RPG |
| 7. | Transformer Temperature monitoring | MASIBUS / PRECIMEASURE / PECON / OEM standard |
| 8. | Bushings / Insulators | Modem / BHEL / WSI / Jayashree / IEC |
| 9. | LV 415 ACB and MCCB | SIEMENS / SCHNEIDER / L&T / LEGRAND / ABB |

| SN | Description | Approved Makes |
|---|---|---|
| 10. | TVM/PQM/LM/Multifunction with MDI and THD | SECURE / SCHNEIDER |
| 11. | LT Current Transformer | KALPA / KAPPA |
| 12. | Indication Lamps- PBs | Schneider Electric / Siemens/ Teknik/ ABB |
| 13. | Power & Aux Contactors | ABB / Schneider Electric / Siemens |
| 14. | MCB, RCBO, ELCB | ABB / Schneider Electric / Siemens |
| 15. | Aux-Electromechanical Relays such as Trip Lock out, Trip coil supervision | GE /SIEMENS / ABB / AVANA Electro Systems |
| 16. | Selector switches, | SALZER / SWITRON |
| 17. | Annunciator /Hooter / Buzzer | ALAN / Minilec |
| 18. | Space heater, Humidistat/Thermostat. | GIRISH EGO / STEGO /ALPA ELECTRIC |
| 19. | Panel Illumination Lamp | Bajaj / Philips |
| 20. | Service Socket | ANCHOR (ROMA)-Export Version |
| 21. | Terminal Blocks | ELMEX / CONNECTWELL / WAGO / PHOENIX. |
| 22. | Control Cables/ Wires-FRLS | Vendor Standard |

Notes on Bill of Quantity and Price Schedule.

1.99 BOQ description is brief for indexing and referencing of item. Bidder shall ensure that equipment /product shall meet/comply to the enclosed Specification, Technical data, all clause / details mentioned elsewhere in the document in all respect. Complete Tender documents shall be read in conjunction.

1.100 Rates offered shall include the Scope and Services: (Supply +IT&C) Basic engineering, Design, drawing preparation / Submission for Approval, Manufacture, Routine Testing, Factory Acceptance Witness Testing, Packing, Supply, delivery up to site and unloading at site. Including temporary Storage, Positioning, Spares, Special tools and tackles, Erection/Installation, Testing and Commissioning, Load Trials and As Built Documentation, Training of O&M Personnel and Handing over.

1.101 The bidder shall quote rates for all the items.

1.102 Rates quoted shall be firm and valid even if the contract is split.

1.103 The quantities of various items indicated are only approximate and payment will be made based on actual quantity executed.

1.104 The quantities of the individual items can vary to any extent and the IISc is at liberty to delete any item.

1.105 Before commencing the work, Bidder, in the event of contract shall submit, “Vendor Drawing and Data” approval and only after the approval shall commence manufacturing work.

1.106 All the equipment shall undergo Routine Tests at Factory as per respective equipment IS/IEC Standards. IISc shall have right to witness these tests during Factory Acceptance Test. The Vendor shall be intimated 2 weeks in advance.

1.107 Bidders are allowed to enter the Bidder Name, Basic Rate and GST percentage for each item only.

NOTE: Contact Details of Independent External Monitors are Provided Below;

- Mr. Najib Shah, Ph no: 9311706358, Email ID: najibshah@hotmail.com
- Mr. MJ joseph, Ph No: 9560697979, Email ID: mohan.joseph@gamil.com

**LIST OF APPROVED MAKES**

| S. NO. | ITEM | APPROVED MAKES |
|---|---|---|
| 1 | MODULAR UPS WITH BATTERY BANK | APC/ SIEMENS/ ABB/ LEGRAND/SOCOMEC |
| 2 | BATTERIES & SMF BATTERIES | EXIDE / HITACHI / PANASONIC /AMAR RAJA / AMARON |
| 3 | LT BUS TRUNKING, RISING MAINS, PLUG/ TAP OFF BOXES, END FEED UNITS AND ACCESSORIES | SCHNEIDER ELECTRIC/ LEGRAND/ ABB/ C&S/ L&T |
| 4 | 1.1 KV GRADE XLPE POWER CABLE | POLYCAB/ CCI / KEI/ HAVELLS/ UNIVERSAL/ RR KABEL |
| 5 | 1.1 KV GRADE FIRE SURVIVAL CABLE | HAVELLS / FINOLEX/ KEI/ TYCO/ HENLAY/ BELDEN/ RAMCRO/ DRAKA/ FR TEK/ RR KABEL/POLYCAB |
| 6 | 11 KV/ 33 KV GRADE XLPE POWER CABLE | POLYCAB/ CCI / KEI/ HAVELLS/ UNIVERSAL/ TORRENT/ RR KABEL |
| 7 | CABLES (CONTROL, SIGNAL & COMMUNICATION, CO AXIAL, PA SYSTEM CABLE) | FINOLEX / HAVELLS/ POLYCAB/ RR KABEL/ BELDEN |
| 8 | GI RACEWAY | OBO BETTERMAN/ LEGRAND/ MK/ SCHNEIDER ELECTRIC/ PROFAB |
| 9 | CABLE GLAND | COMMET / GRIPWEL / DOWELL / RAYCHEM/ BRACO |
| 10 | JOINTING KIT / TERMINATION | RAYCHEM/ DENSONS/ MAHINDRA -3M/ABB |
| 11 | LUGS | DOWELL / SCHNEIDER ELECTRIC / COMETT |
| 12 | DB, MCB, ISOLATOR, RCBO, RCCB | LEGRAND/ SCHNEIDER/ SIEMENS/ ABB / L&T |
| 13 | TELEPHONE JACK | BELDEN / SYSTIMAX / MOLEX / PANDUIT |
| 14 | FLOOR TRUNKING AND ACCESSORIES, PVC | SCHNEIDER/ LEGRAND/ OBO |
| | WALL TRUNKING | BETTERMAAN/ MK |

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| **15** | FRLSH, PVC INSULATED COPPER CONDUCTOR SINGLE CORE CABLE FOR WIRING | HAVELLS/ KEI/ RR KABEL/ POLYCAB / FINOLEX |
| **16** | TELEPHONE CABLES / CO-AXIAL TV CABLES | FINOLEX/ HAVELLS / Q FLEX/ POLYCAB/RR KABEL |
| **17** | TWISTED PAIR SHIELDED CABLE (PA SYSTEM) | HAVELLS / FINOLEX / PANASONIC / BATRA HENLAY /POLYCAB/RR KABEL |
| **18** | ACCESSORIES FOR M S CONDUIT AND PVC CONDUIT | ISI MARKED |
| **19** | M.S. CONDUIT along with accessories | AKG/ BEC/ NIC/ RMCON |
| **20** | PVC Conduit along with accessories | AKG/ BEC/ NIC/ PRECISION |
| **21** | Heavy duty CEILING ROSE | HAVELLS/ ANCHOR/ CRABTREE/ LEGRAND/ SCHNEIDER |
| **22** | TTA/ DESIGN VERIFIED PANELS | ABB/ L&T/ SCHNEIDER/ SEIMENS/ LEGRAND |
| **23** | LT PANELS (OTHER THAN TTA PANELS) | ANY CPRI APPROVED PANEL MANUFACTURER WITH 7 TANK PROCESS |
| **24** | PROTECTION RELAYS FOR 11 KV PANELS | SIEMENS / GENERAL ELECTRIC/ ABB/ SCHNEIDER |
| **25** | SOUNDPROOF ENCLOSURE | OEM OF GEN SET |
| **26** | PLC | SIEMENS/ HONEYWELL/ BCH/ MITSUBISHI |
| **27** | MODULAR SWITCH & SOCKET, INDUSTRIAL SOCKET, FAN REGULATOR, METAL BOXES, RJ 11, STANDALONE RJ 45, TV OUTLET, ETC. | NORTHWEST (ARTISA)/ ANCHOR PANASONIC (VISION)/ CRABTREE (MURANO)/ LEGRAND (ARTEOR) / SCHNEIDER (ZEN CELO) |
| **28** | CALL BELL | NORTHWEST / ANCHOR PANASONIC / CRABTREE / HAVELLS |
| **29** | AIR CIRCUIT BREAKER | ABB EMAX / SIEMENS -3 WL / SCHNEIDER ELECTRIC MASTERPACT NW/ LEGRAND |

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| | | DMX3/L&T(U-Power) |
| **30** | MCCB, MPCB | ABB (T-MAX) / SIEMENS (VL) / SCHNEIDER COMPACT NSX / LEGRAND (DX3) /L&T (D- Sine) |
| **31** | CEILING FAN/WALL FAN | ATOMBERG /HAVELLS/ CROMPTON/ ORIENT/ ALMONARD |
| **32** | LED LIGHT FITTINGS/ FIXTURES | PHILIPS/ LIGHTING TECHNOLOGIES/ TRILUX/ Crompton/Wipro/Panasonic/ Havells. |
| **33** | DAY LIGHT/ OCCUPANCY SENSOR | PHILIPS/ LEGRAND/ SCHNIEDER |
| **34** | PHOTOLUMINISCENT/ LED EXIT SIGNAGES | PROLITE/ PHILIPS/ INSTAMARK/ ACCULITE |
| **35** | SURGE PROTECTION DEVICE | SCHNEIDER ELECTRIC/ OBO BETTERMAN/ L&T/ LEGRAND |
| **36** | COMPLETE LIGHTNING ARRESTER SYSTEM | OBO BETTERMAN/ ERICKO/ ABB |
| **37** | LANDSCAPE STREET/ POLE (ONLY POLE) | PHILIPS / WIPRO/ BAJAJ/ K-LITE/TWINKLE |
| **38** | SFU/FSU/CHANGE OVER SWITCH/HRC FUSE | SIEMENS/ LEGRAND/ HPL/ SOCOMEC/ ELECON |
| **39** | CURRENT TRANSFORMER & POTENTIAL TRANSFORMER | BCH/ C&S/ AE/ KAPPA |
| **40** | MULTIFUNCTION METER, VOLTMETER, AMMETER FOR LT & HT PANEL | SCHNEIDER/ SIEMENS/ SOCOMEC/ AE/ EL-MEASURE/L&T/KAPPA |

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| **41** | SELECTOR SWITCH | KAYCEE/ SALZER/ AE/ SIEMENS/L&T |
| **42** | INDICATING LAMPS | L & T / SIEMENS / GE / AE / IMP |
| **43** | CONTACTORS/ SOFT STARTERS/ STARTERS/ MOTOR PROTECTION RELAYS/RELAY / TIMER / INDICATORS/ PUSH BUTTONS /CONTACTOR/ PANEL METERS/ OTHER ACCESSORIES | SIEMENS / SCHNEIDER ELECTRIC / ABB / LEGRAND / L&T |
| **44** | MULTI-SENSOR DETECTORS, ADDRESSABLE & REPEATER FIRE ALARM CONTROL PANEL, GRAPHIC SOFTWARE, RESPONSE INDICATOR, SOUNDER CONTROL MODULE/ MONITORING MODULE, DUCT CASTING UNIT, ADDRESSABLE MANUAL CALL BOXES, INPUT / | EDWARDS/ HONEYWELL(NOTIFIER) / BOSCH / SIEMENS |

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| | OUTPUT DEVICES, ADDRESSABLE FAULT ISOLATOR, TALK BACK SYSTEM | |
| **45** | PA SYSTEM | HONEYWELL/ BOSCH/ SEIMENS |
| **46** | TEMPERATURE SENSORS, PRESSURE GAUGE, FLOW SWITCH, PRESSURE SWITCH, DIFFERENTIAL PRESSURE SWITCH, ACTUATORS, ROOM THERMOSTAT, HUMIDITY SENSOR, FLOW METER, HARDNESS ANALYZER, PH, CHLORINE, TDS, CO, CO2 SENSORS ETC. | HONEYWELL/ SCHNEIDER ELECTRIC/ SIEMENS / JOHNSON CONTROL / DANFOSS/ TRANE/ H-GURU / BELIMO |
| **47** | GROOVED FITTINGS/ COUPLINGS | VICTAULIC/ TYCO GRINNEL/ RAPID DROP |
| **48** | DWC PIPE | DURALINE/ NOCIL / REX/ FINOLEX/ASTRAL |
| **49** | FIRE BRIGADE CONNECTION, AIR RELEASE VALVE, HYDRANT VALVE, FIRST AID HOSE REEL (DRUM AND BRACKET), FIRE HOSE, BRANCH PIPE, FIREMAN AXE, RRL HOSE, HOSE CABINET | SAFEX/ NEWAGE/ GETECH/ VICTAULIC/ TYCO |
| **50** | BALANCING VALVE, BUTTERFLY VALVE, SLUICE VALVE, NRV/CHECK VALVE, STRAINER AND OTHER TYPE OF VALVES | AUDCO/ ADVANCE/ TYCO/ ZOLOTO/ VICTAULIC/ KIRLOSKAR |
| **51** | INSTALLATION CONTROL VALVE, DELUGE VALVE | HD FIRE/ NEWAGE/ TYCO/ VIKING/ SAFEX/ VICTAULIC |
| **52** | SPRINKLER HEADS | TYCO / HD / NEWAGE/ EVERSAFE/ GETECH/ VIKING /SAFEX |
| **53** | FLEXIBLE PIPE CONNECTION | RESISTOFLEX / DUNLOP / EASYFLEX/NEWAGE/SAFEX |

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| **54** | M.S./ G.I. PIPE | TATA/ JINDAL (HISSAR)/ SAIL/ VIZAG STEEL<br>Note: Pipe shall be ISI mark. |
| **55** | STRAINER (FIRE FIGHTING) | EMERALD / GRANDPRIX / LEADER/HAMMER |
| **56** | AIR VESSEL | SAFEX/ NEWAGE / FIREX/ GETECH/ CEASEFIRE/ OMEX |
| **57** | ANTI-VIBRATION MOUNTING/ RUBBED | DUNLOP/ RESISTOFLEX/ EWREN |

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| | PAD/DUCT SUPPORT ARRANGEMENT | /GERB |
| **58** | FIRE EXTINGUISHERS | SAFEX/ CEASEFIRE/ MINIMAX/ LIFEGUARD |
| **59** | DIESEL ENGINE FOR FIRE FIGHTING PUMP | CUMMINS/ KIRLOSKAR / MATHERPLATT/ GREAVES |
| **60** | PUMPS FOR FIREFIGHTING/ DRINKING & DRAINAGE/ STP/ HOT WATER CIRCULATING | MATHER&PLATT/ FRANKLIN/ KSB/ GRUNDFOS/ XYLEM/ ARMSTRONG/ KIRLOSKAR |
| **61** | LIFT | SCHINDLER/ OTIS/ MITSUBISHI/ JOHNSON/KONE |
| **62** | VRV / VRF UNITS (INDOOR & OUTDOOR), REMOTE CONTROLLER, CENTRAL CONTROLLER, Y JOINTS | DAIKIN/ TOSHIBA / MITSUBISHI ELECTRIC/ HITACHI/ O GENERAL/ |
| **63** | CENTRIFUGAL/AXIAL/VANE AXIAL/IN-LINE FANS FOR VENTILATION, SMOKE EXHAUST, PRESSURIZATION | KRUGER / GREENHECK/ NICOTRA/ AIRFLOW/ COMEFRI/ HUMIDIN (AMCA CERTIFIED FANS FOR PERFORMANCE AND NOISE) |
| **64** | PROPELLER FANS (EXHAUST FANS) | ATOMBERG /HAVELLS/ CROMPTON/ ORIENT/ ALMONARD |
| **65** | AIR HANDLING UNITS, FAN SECTION UNITS | ZECO / EDGETECH / SYSTEMAIRE / FLAKTWOOD/ NUTECH/ YORK/ VTS/ HUMIDIN/ CASILICA |
| **66** | DOUBLE SKIN PLENUM | ZECO / EDGETECH / SYSTEMAIRE / WAVES / AIRCOIL |

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| **67** | MIXING BOX | ZECO / EDGETECH / SYSTEMAIRE / WAVES / AIRCOIL |
| **68** | SUCTION GUIDE | ANERGY / EMERALD / AUDCO/ RAPID CONTROL |
| **69** | ERV, VENTILATION FAN SECTIONS (SECTIONALIZED CONSTRUCTION AS PER | ZECO / EDGETECH / SYSTEMAIRE / WAVES / |

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|---|---|---|
| | SPECIFICATIONS) | AIRCOIL |
| **70** | VARIABLE FREQUENCY DRIVE | ALLEN BRADLEY/ DANFOSS / ABB/ SIEMENS/ HONEYWELL/ EMERSON/L&T/LEGRAND |
| **71** | CONTROLLER (FOR 3RD PARTY INTEGRATION & BMS) | HONEYWELL-TRENDS / SIEMENS-PXC MODULAR, / JCI- METASYS NCE / TRANE |
| **72** | *CAV/VAV BOXES* | JOHNSON CONTROL/ DAIKIN/HONEYWELL/ TRANE/ SEIMENS |
| **73** | CONDENSATE DRAIN PIPES | ASTRAL/FINOLEX/SUPREME/ PRINCE |
| **74** | REFRIGERANT PIPING | RAJCO/MANDEV/CAMIPRO/ MAXFLOW |
| **75** | REFRIGERANT PIPING AND HOT WATER PIPING INSULATION | K-FLEX/ A FLEX/ ARMACELL |
| **76** | G.I. SHEET FOR DUCTING | TATA / SAIL / JINDAL |
| **77** | PREFABRICATED DUCT (WITH GI SHEETS OF MAKES SPECIFIED) | ZECO/ DUCTOFAB / ALPHADUCT/ TECHNOFAB/ NU AIR(NUTECH) |
| **78** | ALUMINUM SHEET | BALCO / HINDALCO / NALCO |
| **79** | ACOUSTIC LINING | UP TWIGA/OWENS CORNING/ K FLEX |
| **80** | CLOSED CELL / OPEN CELL NITRILE RUBBER INSULATION | ARMACELL / A FLEX / K FLEX |
| **81** | GRILL, DIFFUSER, FIRE DAMPER, FIRE DAMPER, VOLUME CONTROL DAMPER | SYSTEM AIR /CARRYAIRE/ AIRMASTER/ AIR FLOW/ CONAIR/ DYNACRAFT |
| **82** | MODULATING MOTOR | DANFOSS / HONEYWELL / JOHNSONS CONTROL / BELIMO |
| **83** | PRE-FILTER | ANFILCO / THERMODYNE / PUROLATOR / SPECTRUM |

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| **84** | PUF PIPE SUPPORT | MALANPUR / LLOYD / BEST PUF |
| **85** | FRESH/ EXHAUST AIR LOUVER | SYSTEM AIR / CARRYAIRE / CONAIR / AIRFLOW |

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| **86** | MS/GI CABLE TRAY | RICOH /INDIANA / PROFAB/ OBO/ LEGRAND |
| **87** | INSULATION I/C PUF, FIBER GLASS, ROCK WOOL, GLASS WOOL, PHENOLIC FOAM | UP TWIGA / OWENS CORNING/ KIMKO/K FLEX/ARMACELL/A FLEX |
| **88** | MOTORS | SIEMENS / ABB / KIRLOSKAR/ CROMPTON |
| **89** | CONTROL VALVE (PID) / 2 WAY, 3 WAY VALVE WITH PROPORTIONATE THERMOSTAT | DANFOSS / HONEYWELL / JOHNSONS CONTROL / BELIMO/ FLOWCON/ZOLOTO |
| **90** | MOTORIZED VALVE / MODULATING VALVE / SOLENOID VALVE | ADVANCE / DANFOSS / BELIMO / JOHNSONS CONTROL/ TYCO/ VICATULIC/ CASTLE/ZOLOTO |
| **91** | AIR WASHER, AIR SCRUBBER | SYSTEMAIR/ ZECOAIRCON/ EDGETECH/ VTS TF AIR SYSTEMS / WAVE/ TRION/ ESPAIR/ RUSSEL/ RO OTS AIR/BRIGHTFLOW/ HUMIDIN |
| **92** | WATER LEVEL SWITCH | VEKSLER / FILPRO / SONTAY / SIEMENS/ ACI/ DWYER/ KELE |
| **93** | DI ELECTRIC INSULATION FLOOR COATING | PROTEXION/ MIL PAINTS/ AMEETUFF TECHNICAL PAINTS |
| **94** | EXPANDED POLYSTYRENE (TF QUALITY) | METTUR-BEARDSELL / SHI / STYRENE PKG. |
| **95** | DUCT CROSS LINKED POLYTHENE FOAM | PARAMOUNT / TROCELLENE |
| **96** | FASTENERS. | HILTI / FISCHER / CANON / TSS |
| **97** | SOLAR PV MODULE | APPROVED AS PER PREVAILING OM /ALMM LIST OF MNRE /APPROVED BY ENGINEER INCHARGE AS PER TENDER SPECIFICATIONS |

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| **98** | SOLAR PV INVERTER / PCU | FRONUS/ SMA/ DELTA/ FIMER / EMERSON/ GROWATT/ GOODWE /SOLIS OEM OF SPV MODULE |

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| **99** | COMBINER BOXES, DC JUNCTION BOARD AND SUB JUNCTION BOX | HENSELGERMANY / ELTSO /VNT/ TECHSER/ OEM OF SPV MODULES. |
| **100** | DC COPPER WIRES | FINOLEX/ HAVELLS/ POLYCAB / KEI /RR KABEL |
| **101** | ENERGY METER / NET METER / BIDIRECTIONAL METER | BESCOM APPROVED MAKES |
| **102** | CCTV CAMERAS, NVR, VMS, JOYSTICK | SONY/BOSCH/ AXIS / PELCO/HONEYWELL |
| **103** | HARD-DRIVE | SAMSUNG / SEAGATE/ SONY / TOSHIBA |
| **104** | LED DISPLAY | SONY / PANASONIC / SAMSUNG / LG |
| **105** | NETWORK SWITCHES, WI-FI ACCESS POINT, WIRELESS CONTROLLER, | CISCO/ JUNIPER / EXTREME |
| **106** | EQUIPMENT RACK | VAL RACK / RITTAL / APW / NET RACK / D LINK |
| **107** | OFC CABLE, LIU, JACK PANEL, PATCH PANEL, PATCH CORD, FACE PLATE, CAT – 6A CABLE, CAT6A I/O, CABLE MANAGER | SIEMON/ SCHNEIDER/ MOLEX/ LEGRAND/ BELDEN/ COMMSCOPE |
| **108** | HMI DISPLAY | HONEYWELL/SIEMENS/ SCHNEIDER / JCI / TRANE |
| | ***NOTE:*** | |
| 1 | The mentioning of particular make under preferred makes does not fulfil automatically for acceptance. The make shall comply all the particular specifications, item of work and other conditions of the contract. | |
| 2 | The model shall get approved and sample shall be submitted for approval by engineer-in- charge before confirming any order to supplier by the contractor. | |
| 3 | For any item not covered in the above list, the contractor shall submit the makes and sample for seeking approval from the engineer-in-charge before supply the material. | |

# BOQ

| Sl.No | Description of item | Unit | Quantity |
|---|---|---|---|
| 1 | Basic Engineering, Detailed Engineering, Design, Supply, Installation, Testing (Routine Tests at Factory & Site) & Commissioning of : Outdoor Extensible, SF6 Gas Insulated Compact 11kV, 630A RMU-4 Way, Comprising of ;<br>a) Loop in+Loop Out+Transformer Feeder+Spare with 4 Nos of 630A Manual & Motorised Vacuum circuit breaker with three position disconnector and earthing +Series trip facility+Self powered Back up Over current and Earth Fault relay+ GE make P14DB Protection Relay with IEC-61850+ Metering + Current Transformer + Capacitive Voltage indicator + Fault Passage Indicator+Local and Remote operation provision.<br>b) Common Aux and Control Chamber with Metering and Protection PT + Aux Control Transformer +24VDC Battery + Charger etc.,.....-complete equipment in complaince with all the clause & details as elaborated in the enclosed Specification, Technical Datasheet, Specical requirements, relevant standards,rules, codes, acts along with Accessories, Approved Makes as directed by Engineer-in-charge. Also Including Special Tools, Tackles & Training. | Each | 1 |
| 2 | Basic Engineering, Design, Supply, Installation, Testing (Routine Tests at factory & Site) & Commissioning of : 11/0.433 kV Prefabricated Packaged Unitised SCADA Controlled Smart COMPACT SUB-STATION (SCSS) complying to IEC-62271-202-2014 amended upto date, fully type tested including Internal Arc test with following items completely assembled, wired, tested at factory and shipped as single composite unit :<br><br>a) Loop in+Loop Out+Transformer Feeder+Spare with 4 Nos of 630A Manual & Motorised Vacuum circuit breaker with three position disconnector and earthing +Series trip facility+Self powered Back up Over current and Earth Fault relay+ GE make P14DB Protection Relay with IEC-61850+ Metering + Current Transformer + Capacitive Voltage indicator + Fault Passage Indicator+Local and Remote operation provision. Common Aux and Control Chamber with Metering and Protection PT + Aux Control Transformer +24VDC Battery + Charger etc...<br><br>b) 1No 800kVA 11kV/0.433kV, 3 Phase, 50Hz, Dry type, HV Resin Cast, LV Resin Cast, DYN11, ANAN, Primary Copper wound, Secondary Copper Wound, with Off Circuit Tap Link, Tap range +5.0 to –10.0% in steps of 2.5%, PRV with contacts, RTD in windings, Temperture Monitoring with losses and impedance as per ECBC -2017. Also Including charges for 8 Hrs Heat Run Temperature Rise Test witnessed by client on Typical Rating.<br><br>c) LV side Switchgear : 415V, 1250A, 50kA EDO ACB, Microprocess based LSIG releases+Protection relaying+CT+Metering+ Controls.<br><br>d) LV final Output side Switchgear : 50kA 4P MCCB : 3 X 630A, 3 X 400A.....complete equipment in complaince with all the clause, details as elaborated in the enclosed Specification, Technical Datasheet, Specical requirements relevant standards, Accessories, Approved Makes as directed by Engineer-in-charge. | Each | 8 |
| 3 | Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories and providing masonry enclosure with cover plate having locking arrangement and watering GI pipe of 2.7-metre-long etc. with charcoal/ coke and salt as required as per CPWD specifications. | Mtr | 42 |

| | | | |
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| 4 | Supplying and laying 25 mm X 5 mm copper strip at 0.50 metre below ground as strip earth electrode, including connection/ terminating with nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of brass nut bolt & spring washer spaced at 50mm) | Mtr | 660 |
| 5 | Supplying of 3C x 400 sqmm high tension 11KV cable, Dry Curing & Dry Cooling with true triple extrusion, simultaneously through a single common head, 3 core under ground XLPE (E), cable having stranded compact circular aluminium conductor, screened insulated, insulation screened with extruded semiconducting compound in combination with copper tape, core laid up extruded inner sheathed of GI flat strip armoured and overall PVC sheathed with specified IS 7098/11/85 with latest amendments. | Mtr | 160 |
| 6 | Laying of one number 3Cx400 sqmm PVC sheathed / XLPE power cable of 11 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required. | Mtr | 160 |
| 7 | Supplying & Making 3C x 400qmm, 11KV (E) Extruded "X" linked for tubing & moulded & cross-linked components using Heat Shrink Stress Control tube having High Permittivity XLPE Terminations- Outdoor cable termination | Each | 17 |
| 8 | Supply & Making 3C x 400sqmm, 11KV (E) Extruded "X" linked for tubing & moulded & cross-linked components using Heat Shrink Stress Control tube having High Permittivity XLPE Terminations - STRAIGHT THROUGH JOINTING KIT. | Each | 12 |
| 9 | Supplying and fixing of the following Safety Equipments: Shock treatment chart laminated (Kannada, English and Hindi) on 8mm Thick wooden board (24''x36'') | Each | 9 |
| 10 | ISI marked 4.5 Kg capacity CO2 Fire Extinguisher with bracket etc., | Each | 10 |
| 11 | Fire buckets of 3 Nos with MS stand filled with sand and water with roof top cover | Each | 10 |
| 12 | 415V metal sheet Danger board as per the regulations with local language (8''x8'') | Each | 20 |
| 13 | Providing and fixing single line diagram of electrical network printed on A0 size photo paper framed with sandwiched fibre glass frame | Each | 10 |
| 14 | Supply and fixing of 70 Watts LED Streetlight luminaire with pressure die cast aluminium housing body for optimal thermal dissipation. Lamp compartment comprising of anti glare clear diffuser with Injection moulded polycarbonate material, delivering superior light output. Rated life Burning Hrs 50000 hr @ Lumen Maintenance of 70%, maximum light intensity should be between 60 degrees to 70 degrees. CCT > 5500K, IP 66 optical and electrical compartment & impact resistance of complete luminaire > IK08. Power Factor >0.9 with mains, Surge Protection- Min 5KV along with Over voltage/ Overload, short circuit/ miss-wiring protection. Compatible for pole mouting with outer dia of 40mm to 50mm. Universal Voltage driver to operate wide voltage range from 100V to 270V 50/60Hz application. Compliance to IS 10322/IEC 60598, LM 79 & LM 80 Adherence with RoHS. UL approved MCPCB. Top access street light with single screw to ensure ease of maintenance at the sight site location with minimized minimal tools. LED Light fixture with ……..W System Power consumption. LED Efficiency>130lm/w, nominal CRI >75. Luminaire manufacturer should have in-house facility accredited by NABL/CPRI & any Government certified agency & Design & Development facility certified by ISO 9001:2008 . Housing with supplier word mark /name shall be Engraved / Embossing on the die cast housing/ Body part. Warranty of 2 Years against any manufacturing defect working under standard electrical conditions as mentioned above should be given by LED manufacturer & Cree/Nichia/ Lumileds/Osram make LED Source. (Make: Philips / Wipro/ Crompton/Bajaj) | Each | 8 |

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| 15 | Fabricating, supplying and erection of 5 Mtr. long hot dip Galvanized Conical hot dip Pole with BSEN 10025 grade S355JO steel plate for shaft, IS 2062 for base plate with door opening arrangements, including suitable boards, Bakelite sheet and MCBs as per IS specifications suitable to withstand the wind speed of 47 m/s in single section and single joint welded as per IS 9595/IS10178AWS having dimensions bottom 125 mm, top 75 mm with 3 mm thick, suitable base plate and 4 Nos of.....long J bolts along with template and the Pole shall be hot dip galvanized in single dipping with not less than 65micron as per ASTM-A123 and 153 etc.,(excluding foundation) as per KPWD SR drawing. | Each | 4 |
| 16 | Supplying, and fixing of Hot dip Galvanized M.S.Bracket suitable for out door luminaries and mounted on Octagonal pole using necessary bolts, nuts etc., complete. Double Arm Bracket with 1000 mm Standard 40/50 mm dia. | Each | 4 |
| 17 | Earth work excavation by manual means for drains,canals, waste weir, draft, approach channels, key trenches, foundation of bridges and such simillar works in all kinds of soils, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools & other appurtenaces required to complete the work. In all kinds of soils depth upto 1.5 m. | CUM | 74 |
| 18 | Providing and laying in position plain cement concrete for levelling course for all works in foundation. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed, laid in layers not exceeding 150 mm thickness, well compacted using plate vibrators, including all lead & lifts, cost of all materials of quality, labour, Usage charges of machineries, curing, and all the other appurtenances required to complete the work as per technical specifications. (The cost of steel reinforcement & formwork shall be paid separately)Mix 1:4:8 Using 40 mm nominal size graded crushed coarse aggregates. | CUM | 27.4 |
| 19 | Providing and laying in position Reinforced cement concrete for all Foundation works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in finished layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes , labour, Usage charges of machinery, curing and all the other appurtenances required to complete the work as per technical specifications. (The cost of steel reinforcement & formwork to be paid separately). M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. | CUM | 83 |
| 20 | Providing Thermo-Mechanically Treated bars of grade Fe-500D or more Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position, binding and anchoring to adjacent members whereever necessary complete as per Design including cost of material, labour, usage charges complete as per specifications. (The laps and wastages shall not be measured separately) | KG | 2400 |
| 21 | Providing and fixing G.I. chain link fabric fencing of required width in mesh size 50x50 mm including strengthening with 2 mm dia wire or nuts, bolts and washers as required complete as per the direction of Engineer-in-charge. (Made of G.I. wire of dia. 4 mm, PVC coated to achieve outer dia not less than 5 mm in required colour and shade) | SQM | 366 |
| 22 | Providing and fixing Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc.,including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shapedwashers etc. complete. Hot finished seamless type tubes including cost of materials, labour, usage charges of machinery complete as per specifications and as per directions of the Engineer-in-Charge | KG | 900 |

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| 23 | Painting with synthetic enamel paint of approved brand and manufacture to give an even shade :Two coats on new work after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand papersmooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. | SQM | 70 |
| 24 | Providing 40 mm dia agreegate for substation yard including the spreading etc as required. | CUM | 15 |
| 25 | Preparation of necessary drawings, getting approval from the Centarl Electrical Inspector, furnishing completion report, arranging for inspection,obtaining approval for commissioning all the CSSs by paying necessary fees for inspection etc., as required. | Job | 1 |