ADDITIONAL CONDITIONS OF CONTRACT (ACC)

1.0 The following Additional Conditions of Contract shall be read in conjunction with General Conditions of Contract. If there are any provisions in these Additional Conditions of Contract, which are at variance with the provisions of General Conditions of Contract, the provisions in these Additional Conditions of Contract shall take precedence.

2.0 INTRODUCTION
EPI is constructing J.C.GHOSH & P.C.ROY SCIENCE COMPLEX for Indian Institute of Technology (IIT), Kharagpur. Now, IIT-Kharagpur intend to provide centrally air conditioning system in the aforesaid building to mitigate the need of the user.

3.0 SCOPE OF WORK INCLUDED IN THE CONTRACT
The brief scope of work included in this tender shall include (but not limited to) Civil, Plumbing, Sanitary, Internal & External Electrical including installation of transformer, PCC Panel required for central Air conditioning System (HVAC), for J.C.Ghosh & P.C.Roy Science block at IIT Kharagpur.

Apart from the above, any other services not covered above but required as per direction of Engineer In-charge of EPI are deemed to be included in the scope of work. The work is to be carried out as per bill of quantities and tender conditions.

4.0 CO-OPERATION /CO-ORDINATION
Works of the J.C.Ghosh & P.C.Roy Science block is still going on. The bidder has to execute the work with proper coordination with the executing contractor/sub-agencies working there.

However, if due to negligence, non cooperation of the bidder or his associates during execution of the work of the J.C.Ghosh & P.C.Roy Science block suffers damage, loss etc. if any, the same should be got rectified/made good by the bidder at his own cost failing which EPI may get the said rectification/making good done by other agencies and the cost of the same will be recovered from the bidder. The decision of EPI regarding extend of rectification and cost thereof will be final and binding on the bidder.

5.0 DISQUALIFICATION
The tenderers may note that they are liable to be disqualified and not considered for the opening of Price Bid if;

a) Representation in the forms, statements and attachments submitted in the prequalification document are proved to be incorrect, false and misleading.
b) They have record of poor performance during the past 7 years such as abandoning the work, rescinding of contract of which the reasons are attributable to the non-performance of the contractor, inordinate delay in completion, consistent history of litigation / arbitration awarded against the contractor or any of its constituents or financial failures due to bankruptcy etc. in their on-going /past projects.

c) They have submitted incompletely filled in formats without attaching certified supporting documents and credentials to establish their eligibility to participate in the Tender.

d) If the tenderers attempt to influence any member of EPI.

5.1 EPI reserves its right to take appropriate action including disqualification of tenderer(s) and forfeiture of the earnest money deposited by him/them as may be deemed fit and proper by EPI at any time without giving any notice to the tenderer(s) in this regard. The decision of EPI in the matter of disqualification shall be final and binding on the tenderers.

5.2 The set of tender documents shall contain tender drawings (one set of hardcopy). The original hard copy of tender drawings shall be returned along with the tender documents duly signed and stamped by the tenderer & shall form part of agreement.

6.0 SPECIFICATIONS

6.1 The work in general shall be carried out as per latest CPWD/ WB PWD specifications, for Civil Works, Internal Electrical works (updated with correction slips issued up to last date of submission of tender) and latest CPWD specification, New Delhi for electrical works (updated with correction slips issued up to last date of submission of tender) unless otherwise specified in the nomenclature of the individual item of the particular specifications of concerned items of works.

6.2 For items not covered under latest CPWD specification for Civil Works/ latest CPWD specification for Electrical Works, Fire fighting works and in particular specification or nomenclature of the individual item as above, the work shall be done as per latest relevant BIS codes of practice.

6.3 In case any specification is not covered under para 6.1 & 6.2 above the work shall be carried out as per the provisions of technical specification attached with this tender.

6.4 In case of non availability of any specification in the above paras or any overlapping provisions, non-clarity of any issue, applicability of particular provision out of above shall be decided by Engineer-in-charge whose decision shall be final & binding on the contractor.

6.5 Thermo Mechanically Treated bars conforming to IS: 1786, Fe 500 grade as required, from approved manufacturers viz SAIL/RINL/TISCO shall be used. Incase of non
availability of steel of these makes, TMT bars of other manufacturers as per IS 1786, Fe 500 grade as required, may be allowed to be used with the prior approval of Engineer-in-charge. In case TMT bars from manufacturer other than SAIL/RINL/TISCO is allowed to be used, a deduction of RS. 2 (two) per Kg shall be made from the bills of the contractor. The other provisions of clause 45.2 of GCC remains unchanged.

6.6 Ordinary Portland Cement (OPC) as per IS :8112 shall be used on the works. In case of non-availability of ordinary Portland cement, the Portland Pozzolona Cement (PPC) as per IS:1489-1991 can be used. However, in case of using Portland Pozzolona Cement prior approval is to be taken from Engineer-in-charge. The other provisions of clause 45.1 of GCC remain unchanged.

7.0 CLAUSE NO 69.1 OF GCC STANDS MODIFIED AS UNDER:

If the rates of the altered, additional or substituted work cannot be determined in the manner specified in sub-clauses (i) to (iii) above, then the Contractor shall, within 7 days of the date of receipt of the order inform the Engineer-in-Charge the rates which he intends to charge for such class of work, supported by analysis of the rate or rates claimed, and the Engineer-in-Charge shall determine the rate or rates on the basis of prevailing market rates of the material, labour, T& P etc. plus 10% (Ten percent) to cover the Contractors supervision, overheads and profit and pay the Contractor accordingly. The opinion of the Engineer-in-Charge as to the current market rates of materials and quantum of labour involved per unit of measurements will be final and binding on the contractor. However, the Engineer-in-Charge, by notice in writing, will be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner, as he may consider advisable. But under no circumstances, the Contractor shall suspend the work on the plea of non-settlement of rates of items falling under the clause.

8.0 THE CLAUSE NO. 72.1 OF GCC SHALL BE REPLACED AS UNDER:

The contractor shall ensure satisfactory progress during the execution of work according to the detailed Bar Chart/PERT chart so that the activities are completed in the period allowed in the completion schedule as given at Sl. No.11.0 of Additional Conditions of Contract (ACC). The contractor should submit the weekly progress report as per format approved by Engineer-in-charge. However, the Contractor shall also maintain monthly progress strictly in accordance with bar chart and / or detailed time schedule that will be worked out on the basis of completion schedule for various stages mentioned at Sl. No. 9.0 of ACC. If the Contractor fails to maintain the required progress in terms of clause no 72.4 of GCC or relevant clause of additional conditions of contract to complete the work and clear the site on or before the completion date or extended date of completion, he shall without prejudice to any other right or remedy available under the law to EPI on account of such breach, pay compensation the amount calculated at the rate of 1% per week or part thereof of subject to 10% of the total contract value as awarded.
9.0 **CLAUSE NO. 72.4.1 OF GCC STANDS MODIFIED AS UNDER:**

Within 10 (Ten) days of date of Letter of Intent, the contractor shall submit a Time and Progress Chart (CPM/PERT/Quantified Bar Chart) and get it approved by the Engineer-in-Charge. The chart shall be prepared in direct relation to the time stated in the contract documents for completion of items/ scope of the works. It shall indicate the forecast (mile stones) of the dates of commencement and completion of various items trades, sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the contract documents, to ensure good progress during the execution of the work. The physical report including photographs shall be submitted by the contractor on the prescribed format & the intervals (not later than a month) as decided by the Engineer-in-Charge. The compensation for delay as per clause 72.1 (revised as per ACC) shall be leviable at intermediate stages also, in case the required progress is not achieved to meet the time deadlines of the completion period and /or milestones of time and progress chart provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the tendered value of work.

10.0 **ARBITRATION :**

10.1 **Clause no. 76.1 alongwith note of GCC** - Deleted

10.2 **Clause no.76.2 of GCC - ARBITRATION BETWEEN CENTRAL PUBLIC SECTOR ENTERPRISES INTER SE / GOVERNMENT OF INDIA DEPARTMENTS / MINISTRIES**

i) In the event of any dispute or difference relating to the interpretation and application of the provisions of the contract, such dispute or difference shall be referred by either party to the arbitration as per the instructions (Office Memorandum / Circulars) issued by Govt. of India from time to time with regard to arbitration between one Government Department and another, one Government Department and a Public Sector Enterprise and Public Sector Enterprise inter se.

ii) Subject to any amendment that may be carried out by the Government of India from time to time, the procedure to be followed in the arbitration shall be as is contained in D.O. No.DPE/4/(10/2001-PMA-GL-1 dated 22.01.2004 of Department of Public Enterprises, Ministry of Heavy Industries and Public Enterprises, Government of India or any modification issued in this regard.

10.3 **Clause No.76.3 of GCC, stands modified as under :**

**JURISDICTION :**
The courts in Kolkata alone will have jurisdiction to deal with matters arising from the contract, to the exclusion of all matters.

11.0 COMPLETION PERIOD

The completion period for the total work is 4 (Four) months to be reckoned from the 10th day from the date of issue of LOI/ Work Order

12.0 PLANT & MACHINERY

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Minimum numbers required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Concrete Batch Mixer (Min 4 Bag capacity)</td>
<td>One</td>
</tr>
<tr>
<td>2.</td>
<td>Leveling Instruments</td>
<td>One</td>
</tr>
<tr>
<td>3.</td>
<td>Vibrators (Petrol / Electrical)</td>
<td>Two</td>
</tr>
<tr>
<td>4.</td>
<td>Needles of Vibrator</td>
<td>Six</td>
</tr>
<tr>
<td>5.</td>
<td>Concrete Mixers alongwith weigh batcher</td>
<td>Two</td>
</tr>
<tr>
<td>6.</td>
<td>Lighting Equipment</td>
<td>As per Requirement</td>
</tr>
<tr>
<td>7.</td>
<td>Electrically operated Concrete Cube Testing Machine with Digital Indication</td>
<td>One</td>
</tr>
<tr>
<td>8.</td>
<td>Tools and tackles for Electrical Installation works</td>
<td>As per Requirement</td>
</tr>
</tbody>
</table>

Note:

a) Any other equipment for site test as outlined in CPWD/BIS specification and as directed by the Engineer-in-Charge.

b) The quantities of equipments indicated are tentative and can be increased as per the requirement of work OR as per the direction of Engineer-in-Charge. The above equipment list is indicative and not complete. The contractor has to deploy all the required equipment to complete all the works within stipulated specifications & time period as contract documents.

c) The contractor will not be allowed to take out equipments from the site without the written permission of Engineer-in-Charge.

13.0 TECHNICAL MANPOWER REQUIREMENT

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Minimum numbers required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Site-in-Charge, Engineering graduate with eight years of experience / DCE with ten years of</td>
<td>One</td>
</tr>
</tbody>
</table>
2. Site Engineer, BE (Electrical) and BE (Civil) with five years of experience  One Each
3. Billing Engineer, DCE with five years of experience  One
4. Quality control and Survey Engineer, DCE with five years of experience  One
5. Safety Officer (with 5 year Experience)  One

Rate of Recovery in case of non compliance of above manpower are as follows:--:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Qualification</th>
<th>Experience (Years)</th>
<th>Rate of Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Site-in-Charge, Engineering graduate with eight years of experience / DCE with ten years of experience</td>
<td>10</td>
<td>Rs.60,000/- per month</td>
</tr>
<tr>
<td>2.</td>
<td>Site Engineer, BE (Electrical) and BE (Civil) with five years of experience</td>
<td>5</td>
<td>Rs.40,000/- per month</td>
</tr>
<tr>
<td>3.</td>
<td>Billing Engineer, DCE with five years of experience</td>
<td>5</td>
<td>Rs.25,000/- per month</td>
</tr>
<tr>
<td>4.</td>
<td>Quality control and Survey Engineer, DCE with five years of experience</td>
<td>5</td>
<td>Rs.25,000/- per month</td>
</tr>
<tr>
<td>5.</td>
<td>Safety Officer (with 5 year Experience)</td>
<td>5</td>
<td>Rs.25,000/- per month</td>
</tr>
</tbody>
</table>

If the contractor fails to deploy the technical manpower stated above, EPI reserves the right to deploy the technical manpower and the cost of the same shall be recovered from the contractor.

14.0 FINAL BILL

The final bill will be submitted by the contractor within 90 days from the date of acceptance of completion of work accompanied by the following documents:

a) Completion certificate issue by the Engineer-in-Charge specifying the handing over of the work including list of inventories (fittings & fixtures).
b) Computerized stage wise payment schedule.

c) No claim certificate by the contractor.

d) No claim certificate from the sub-agencies / vendors engaged by the contractor.

e) ‘As built’ drawings.

f) Periodical services and measurement books.

g) Drawings for layout of underground cables and details showing location of electric cable joints etc.

h) All operation and maintenance manuals.

i) All statutory approvals from various state / central govt. local bodies, if required for completion & handing over of the work as included in scope of Contractor.

j) Manufacture’s guarantee of various machines / equipments installed as part of works.

15.0 CONCRETING

15.1 The concreting shall be machine mixed with equipment as approved by Engineer-in-Charge. The contractor may opt to use Ready Mixed Concrete of repute make after obtaining prior approval from the Engineer-in-Charge.

15.2 The contractor shall provide construction joints only at the specified positions and as per BIS codes for columns. In case the concreting is to be done in two lifts the minimum height of first lift of columns shall be 1.5 meters.

15.3 The stone aggregate and sand of required zone shall be from the quarries as approved by Engineer-in-Charge. The samples of the materials shall be got approved along with the mix design.

15.4 Plasticizers of the required specification and make shall only be permitted as per approved mix design. The cost of plasticizers / additives is deemed to be included in the rates of concrete & nothing extra shall be payable on this account.

15.5 Ready mix concrete brought from outside sources or produced at site shall have minimum quantity of cement as specified in BIS specifications and as per approved design mix.

15.6 The contractor shall provide all cut outs in RCC work in Co-ordination with other agencies and as per instructions of Engineer-in-Charge and nothing extra shall
be payable. In case the same is not provided by the Contractor the same shall be got done at their risk & cost.

16.0 **BRICK WORK.**

16.1 The brick should be minimum class designation 75 conforming to IS 1077:1992.

16.2 The brick work for all external wall should be done from outside. The rigid scaffolding of MS pipe and the supports shall be sound and strong, with horizontal MS pipe. The contractor shall be responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it. Due care shall be taken by the contractor to ensure the execution sufficient quantity of scaffolding foe this purpose so as to complete the project within stipulated time.

16.3 **Fly ash** brick works shall be with the bricks of specified grade & source as approved by Engineer-in-Charge and no efflorescence die to salt peter shall be allowed. The contractor shall have to give proper treatment in any such case and nothing extra shall be payable and the rates quoted shall be all inclusive.

17.0 **CENTERING & SHUTTERING**

17.1 Centering & shuttering works for columns shall be made out of laminated shuttering plywood of minimum 12mm thickness as per BIS, with angle iron frame. The centering, shuttering and staging system shall be got approved from the Engineer-in-charge.

17.2 The shuttering used for beam shall be of laminated shuttering plywood as per BIS. The support system shall be integrated with the slab. For slabs in case ply wood shutters is not used, welded steel plates will be allowed to be placed in uniform pattern. The thickness of plates and pattern to be got approved from the Engineer-in-charge.

17.3 All joints in the shuttering i.e. plate to plate etc shall have to be sealed with adhesive / foam, to ensure water tightness of the form work.

17.4 All shuttering work for Architect features shall be with fiber glass mould sand the rate quoted by the contractor in the schedule of rate shall be inclusive of same.

17.5 All shuttering joints the slab, beams and lintels etc shall be treated with tape or required width to make it water tight and the rates quoted for centering shuttering work shall be all inclusive and nothing extra whatsoever shall be payable over and above the quoted price.

17.6 The shuttering shall be tightened by using runners, tie rods and bracing etc. Supports shall be adequate and proper.
18.0 GENERAL

18.1 Flooring works shall be executed as per the approved drawings / design & specifications. The pattern shown in the tender drawings, if any, and be modified as per the site requirements by Engineer-in-charge within the proportions of the flooring materials to be provided and nothing extra whatsoever shall be payable over and above the rate quoted.

18.2 The water proofing for the terraces, underground tanks / toilet floor etc, shall begot executed only through the authorized applicators of the manufacturers and the guarantee for the same shall be in the name of EPI / owner for a period of ten years after the expiry of defect period liability on the prescribed format given in the GCC.

18.3 Plumbing & Sanitary work to be executed by licensed plumber and the plumbing scheme / drawing to be got approved from statutory authorities through the appointed licensed plumber without any extra cost. The agency shall have to submit the valid license of plumbers before starting the work.

18.4 CI pipes for sanitary and GI pipes for water supply if fixed in RCC members like columns, beams etc. shall be fixed with scrub plugs.

18.5 The contractor shall be responsible for all protection of sanitary, water supply electrical fittings & fixture against pilferage, breakage during period of installation until the completion of work and handed over to EPI.

18.6 Welding wherever required in the work like in grill, railing etc. shall be done in full length of the contract area and grinding shall be done properly to get an even surface, SGRC covers for manholes etc. if provided, shall have name of owner /client and year of manufacturer as engraved.

18.7 The electrical works shall be executed only through licensed electrician and the agency shall have to submit the valid license of electricians before starting the work.

18.8 It will be the sole responsibility of contractor to obtain all statutory approvals / compliance required for construction / implementation of the project including right of way Forest clearance and completion clearance from the all relevant statutory bodies for plumbing, sewerage, sanitary and PHE work, fire department for fire protection, fire fighting, fire fighting installation, electrical works etc. and for all other services as included in the scope of contract etc. From the concerned department as required within the stipulated time frame. Liaison work on behalf of EPI / owner with the local bodies will also have to be done by the contractor. Nothing extra shall be payable to contractor on this account.
18.9 The contractor shall make necessary safety arrangements at site including as mentioned in GCC and indemnity EPI against any consequence of accident at site.

18.10 The tenderer shall engage specialized agency having adequate technical capability & experience of having executed Fire Fighting & Fire Alarm works. The specialized agency for the work shall be got approved by Engineer-in-charge well before actual commencement of the respective items of work.

18.11 The contractor shall erect GI sheet fencing along the periphery of the site as per drawing of EPI with proper colour as directed by the Engineer-in-charge and name/logo, safety slogan etc. written at appropriate places within ten days of issue of LOI. The contractor shall be responsible for daily cleaning of this fencing with water etc. to keep the fencing in neat & clean condition at all times. The damaged fencing should be replaced immediately by the contractor. The cost of MS sheet fencing, its maintenance etc. is deemed to be included in the quoted rates. The contractor shall engage sufficient number of security guards at his cost to ensure controlled entry to site and not to allow unauthorized personnel at site.

18.12 The contractor shall have to execute the work in pace and in such a way to facilitate agencies engaged simultaneously for execution of other works required for completion of the Building. No claim shall be entertained due to work being executed in the above circumstances.

18.13 Unless otherwise specified in the schedule of quantities, the rates tendered by the Contractor shall be all inclusive and shall apply to all heights, floors including Terrance, leads and depths and nothing extra shall be payable on this account.

18.14 On completion of work, the tenderer shall submit at no extra payment four prints of “as built” drawings to Engineer-in-Charge.

19.0 QUALITY ASSURANCE PROGRAMME

The following paragraph shall be added to clause no 81.0 of General Conditions of Contract (GCC) as under: I

The quality testing of materials are to be done as per the frequency of sampling & testing prescribed in relevant code of different items of works, all mandatory tests of materials shall be conducted at site laboratory and the tests not possible at site shall be tested outside through reputed laboratories like Regional Engineering College (NIT)/Government Engineering College /National Test House / IIT/ M/s Shriram Test lab. Private Engineering College & polytechnic college are not allowed for testing.
20.0 MOBILIZATION ADVANCE:-

Clause 8.0 of General Conditions of Contract is deleted.

21.0 FACILITIES

The sub-clause 28.3 of the clause no. 28 of General Conditions of Contract(GCC) for Furnished Office Accommodation & Mobility and Communication to be provided by the Contractor to EPI shall be replaced and read as under:-

The contractor shall make his rates in Bill of Quantities sufficiently comprehensive to cover the cost of the facilities as per details shown below and the contractor shall not be entitled for any extra payment for the same.

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. OFFICE WITH FACILITIES – The contractor is to provide Office with following facilities till defect liability period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A (i) OFFICE ACCOMODATION</td>
<td>Sq.Ft</td>
<td>200</td>
</tr>
<tr>
<td>Furnished office accommodation at one or more locations as per direction of Engineer-in-Charge with basic amenities like toilets, drinking water arrangement, lights, other facilities for winter and summer season etc. for exclusively EPI’s Engineer &amp; Staff and maintenance of the same till Defect Liability Period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) FURNITURE</td>
<td>Nos.</td>
<td></td>
</tr>
<tr>
<td>Office Tables</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Office Chairs</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Executive Table &amp; Chair Set</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Steel Almirah (Big)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b) Office Boy on full time basis only for EPI.</td>
<td>No.</td>
<td>01</td>
</tr>
</tbody>
</table>

In case the above facilities are not provided by the tenderer within 10 (ten) days of award of work or replacement is not provided within the specified period, EPI shall arrange the same at the risk and cost of the tenderer and make the recoveries from the bills of the tenderer for the same. The decision of EPI shall be final and binding on the tenderer in this regard.
22.0 SITE LABORATORY

22.1 As part of the contract the contractor shall establish and maintain a site laboratory for the testing of construction material under the direction and general supervision of Engineer-in-charge. The laboratory room shall be constructed and installed with the required and appropriate facilities. Temperature and humidity controls shall be made available wherever necessary during the testing of samples.

All equipment as required shall be provided by the contractor so as to be compatible with the testing requirements specified. The contractor shall maintain the equipment in good working conditions for the duration of the contract. The Contractor shall provide approved qualified personnel to run the laboratory for the duration of the contract. The number of staff and equipment available must at all times be sufficient to keep pace with the sampling and testing program as required by Engineer-in-charge. The contractor shall fully service the site laboratory and shall supply everything necessary for its proper functioning including all transport needed to move equipment and samples to and from sampling points on the site etc. The contractor shall re-calibrate all measuring devices whenever so required by the Engineer-in-charge and shall submit the results of such measurements without delay.

23.0 ALTERATION IN SPECIFICATION, DESIGN AND DRAWING

The Engineer -In-Charge shall have power to make any alterations in, omissions from, additions to or substitutions for, the original Specifications, Drawings, Designs and Instructions that may appear to him to be necessary during the progress of the work, and the contractor shall carry out the work in accordance with any instructions which may be given to him in writing signed by the Engineer-In-Charge and such alterations, omissions, additions or substitutions shall not invalidate the contract and any altered, additional or substituted 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 the same conditions in all respects on which he agreed to do the main work. The rates for such additional, altered or substituted work under this clause shall be worked out in accordance with the provisions stipulated in the clause no. 69.0 of the General Conditions of Contract.
ANX-1

SPECIFICATION FOR DISTRIBUTION TRANSFORMER

1.0 GENERAL:

This job covers design, manufacture, and assembly, shop testing, packing and delivery to site, supervision of erection, pre-commissioning tests and commissioning to ensure safe and trouble-free continuous operation of one (1) Nos. Indoor type, oil-immersed 2500 kVA 11/0.433 kV, Distribution Transformers to be installed on the transformer foundation.

1.1 The turns ratio of the transformer shall be so selected that the LV side voltage at full load condition should be 415 V while the primary being at rated voltage on principal tap position.

1.2 The transformer shall be capable of operation continuously at its rated output without exceeding the temperature rise limits specified in the IS.

1.3 Transformer shall be capable of continuous operation at the rated output at any particular tap position under following power system conditions:

- Voltage variation of +15% of the rated voltages of 11kV on primary side & 415 V on Secondary side.
- Frequency variation of ±5% of rated frequency of 50 Hz
- Combined voltage & frequency of 10% (absolute sum)

1.4 The transformer should withstand short circuit for 3 secs. Between phases or between phase to ground with voltage maintained on one side without damage to any part.

1.5 The symmetrical fault levels of the system to which the transformer would be connected are:

- 350 MVA at 11kV
- 31 MVA at 415V

1.6 The transformer should be designed with particular attention to the suppression of harmonic voltage: especially 3rd, 5th, and 7th so that the detrimental effect therefore is avoided.

1.7 The Transformer should be absolutely free from noise and vibration even when operating at 10% higher voltage over the rated voltage.

1.8 The transformer shall have overload capacities as per IS 2026.

1.9 Necessary first filling of oil shall be supplied for the transformer in non-returnable container for out-doors storage. 10% excess oil shall also be provided to take wastage into account.

1.10 The following technical particulars should follow

A. For Indoor Type for 11kV/415 V Transformer

a) Service. : Indoor Type for 11kV/415 V
b) Quantity: 1No. for 2500kVA
c) Rating: 2500 kVA
d) Primary Voltage: 11000 volts
e) Secondary Voltage (No load): 415 volts
f) Type: Oil immersed & step-down
g) Cooling: ONAN
h) Connection: Vector Group Dyn 11
i) Type of tap changing looking arrangements: Off circuit manually operated with
   With handle position indicator.
j) No of Taps / Range steps (Minimum): Seven (7) + 7.5% + 5% & + 2.5% in
each step.
k) Terminal arrangements:

<table>
<thead>
<tr>
<th>H.V.</th>
<th>Detachable type air insulated cable end box for accepting 1x3c, 70 to 150 mm² XLPE, 11kV cable from bottom.</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.V.</td>
<td>Adequate space and design are required for housing end termination of 1 to 9 nos. 3.5 core 400 sqmm L.T XLPE cable 11kV/415V Trf. to PCC panel keeping in view for ease of future maintenance work.</td>
</tr>
<tr>
<td>Neutral</td>
<td>For service neutral: Inside secondary side (L.V.) terminal box for fixing the neutral bus of the trucking. For neutral earthing: Separate bushing for solid earthing by 2 nos. 50 x 6mm copper strips are required.</td>
</tr>
<tr>
<td>H.V. &amp; L.V. terminal position angle to suit the layout requirement</td>
<td>Placed opposite (i.e. 180° apart)</td>
</tr>
</tbody>
</table>

2.0 CONSTRUCTIONAL FEATURES

2.1 The transformer tank should be welded in construction, fabricated from sheet steel of adequate thickness, ready to absorb stress due to short circuit.

2.2 The transformer shall be provided with bi-directional wheel, Jacking pads, lifting eye holes, pulling lugs, oil sampling taps on top as well as bottom, oil filter valves, thermometer pocket for top oil temperature, double diaphragm type explosion vent with equalizer pipe connection to conservator air space and silica gel breather.

2.3 The transformer bushing shall conform to the requirements of minimum clearance specified in I.S: 2026 with latest version. H.V. bushing shall be porcelain type with studs.

2.4 The core and coil assembly of the transformer shall have following features:

- Interleaved grade non-aging, low loss, high permeability, grain oriented, cold rolled silicon steel lamination properly treated core material and electrolytic copper of suitable grade coils, both properly insulated and stacked to minimize impulse and power frequency voltage stress.
- Insulating spacers, barriers and bracings are designed for free oil circulation and minimum hot spot of the winding.
- Supports are to prevent vibration and short circuit stress.
• Fixed position with respect to the transformer movement and short circuit stress.

2.5 Marshalling Box:

Sheet steel, weather proof with glass window. Complete with terminal block and wired up to the signaling devices provided on the transformer NCT, WTI, OTI, OLG, Buchholz Relay alarm & trip contacts, aux. Power supply, cubicle illumination lamp & door limit switch contacts terminated to the terminal block. Removable bottom gland plate for control cable entry.

2.6 Tapping & Tap Changers shall be suitable for voltage variation ranging between \(+7.5\%\) to \(-7.5\%\) of the rated voltage in steps of 2.5\% with respect to the principal tap position. The transformer shall be capable of operation at rated output at any tap position provided the voltage does not vary by more than \(+10\%\) of the rated voltage corresponding to that tap position. Electromagnetic balance shall be maintained between primary and secondary.

**Tap changer** shall be of **off load type**

1) FITTINGS AND ACCESSORIES

As per recommendation in the latest revisions IS but definitely including the following:

- Conservator tank connected to main tank by pipes through double float type Buchholz Relay with valves at both sides of the Relay and fitted with Dial type Magnetic oil level Gauge on one side and prismatic oil level gauge on the other side, both being visible from the ground level.
- Buchholz Relay shall have separate alarm & trip contacts wired up to the terminal block of marshalling Box.
- Winding Temperature Indicator with maximum, Reading Pointer and two separate contacts for alarm & trip duly wired up to the terminal block of Marshalling Box.
- Oil Temperature Indicator with separate alarm & trip contacts wired up to the terminal block of Marshalling Box.

2.7 Capitalization of losses

The No Load Loss and Load Loss (Copper Loss) quoted by the Tendered shall be guaranteed under penalty.

Capitalization cost would be computed for evaluation purpose and later on penalty levied in case test figures differ with the guaranteed figures beyond IS tolerance.

2.8 Documents/Drawings to be submitted along with the Quotation.

a) Technical particulars along with literature and write-up on the constructional features of each part, fittings and accessories.

b) Details list of accessories & fitting.

c) General Arrangement drawings of the transformer indicating the overall dimensions.

d) Certified percentage impedance & loss figures.

e) Type Test certificate including CPRI Test Report of an identical transformer.
**Warranty:** Two years from the date of successful commissioning at site.

**Factory Inspection:** Factory inspection and testing are to be arranged by the contractor for IIT officials by the contractor/Manufacturer

**Erection:** The contractors are liable to perform all the arrangement for erecting the **Transformer** on MS channels including supply of iron channels of approx size 150 x 75 x 75 mm as approved by the Engineer or on RAIL of suitable sized and fixing them on cable trench with foundation bolts including supply of all hardware for complete execution of the job.
1.0 GENERAL

Power control centre or PCC shall comprise of eleven panel Circuit Breaker assembly comprising of 1 Nos. 4pole 4000 amps Air Circuit Breaker, 415Volts as incomer and outgoings consisting of the following features:

a) 3200 ACB, 4 pole, 75kA, MDO type with SR-18 G releases – 1no

b) 800 amps MCCB, 4 pole, with microprocessor based releases (O/C.E/F, S/C) -- 4no

c) 63 amp, 4 Pole, MCB, 10 kA –4 no

d) TPN Aluminium Bus-Bar: 6000 amps with colored insulated and sleeved Electrolytic AL/copper bus bars of 50 kA symmetrical fault current withstanding capacity.

The ACB and MCCB should be mutually coupled with 415 volts TPN 6000 amps Bus Bars with suitable rated Al bars only.

CONSTRUCTION

1.1 Indoors, floor mounted, self-standing, compartmentalized cubicle type made of minimum 2mm thick CRCA steel sheet.

1.2 Front operated (having operating height between 450mm and 1800mm from operating floor) and rear access type.

1.3 Suitable for bottom and top entry cables depending on final lay out. Accordingly horizontal bus bar chamber will be either at bottom or at top.

1.4 Having detachable type gland plat of 4mm thickness for drilling and fixing of cable glands at site.

1.5 Each cubicle door casketed and having concealed type hinged front door knob.

1.6 Provided with a continuous earth bus bar of 50x6mm copper strip running throughout the entire length with two (2) earthing terminals at ends suitable for connecting specified PE conductors.

2.0 BUS-BARS

3.0

3.1 Bus-bar grade, high-conductive electrolytic copper / aluminium conductor having adequate size to carry the continuous current 6000 Amp breaking at the design ambient temperature and the max. Short circuit current specified.

3.2 Braced to withstand the short circuit force developed max short circuit specified for 1 second.

3.3 Provided with heat shrinkable type PVC insulating sleeves for bus bars and shrouds for bus bar joints, colour codes for three phases and neutral.

3.4 Bus bar supports of epoxy resin molded or FRP type insulator.

4.0 INCOMING FEEDERS AND OUTGOING FEEDERS

4.1. 1 no. Incoming feeder shall be of Air Break, horizontal draw out (MDO) type 4 pole, 415V having continuous current rating of 4000 amps with Microprocessor based SR 18 G releases.

a) Outgoing feeders consisting with the following features:-

a) 3200 amps ACB, 4 pole, 75kA MDO type with SR-18 G releases – 1no

b) 800 amps MCCB, 4 pole, with microprocessor based releases (O/C.E/F, S/C) -- 4no

c) 63 amp, 4 Pole, MCB, 10 kA –4 no

b) All ACB and MCCBs should be with microprocessor based releases having over current, short circuit and earth fault features and should have $I_{cs}=I_{cu}=I_{cw}=100\%$ for ACBs and $I_{cs}=I_{cu}=100\%$ for MCCBs

Special Feature:-
1.1 a) The circuit breakers shall be provided with manually operated spring charged stored energy closing mechanism, with features like solid state Release with SR 18G (L&T), shunt trip release, earth fault release, with fault indication etc and providing Intelligent panel meter (QUASAR meter 3ph, 4 wire, 415 volt, LT meter with 5A CT, L&T make with RS 485 communication port) for each Air Circuit Breaker & MCCB units.

5.3b) The I/C unit should also have analog type Voltmeter, Ammeter & C.T with selector switches apart from Quasar meter

5.3c) All C.Ts should be cast resin type.

5.3d) The I/C and O/G unit should also have Multifunctional Meter with RS485 port & suitable rating C.T with selector switches apart from Quasar meter.

1.2 ALL ACBs shall be provided with R, Y, B, ON, OFF, TRIP, SPRING CHARGE, TRIP CIRCUIT HEALTHY etc indicator and manual close and trip push buttons as required. All MCCB unit should have ON, OFF, TRIP indications, Rotary handles and spreader links. Interconnections with B/Bar should be with Suitable aluminium buses only.

1.3 The following indicating light (LEDs) on the front of the compartment shall be provided.

   - Breaker Open - GREEN
   - Breaker close - RED
   - Spring Charged - White
   - Trip circuit Healthy - Yellow

1.4 Mechanical safety inter lock shall be provided for:

   a) The breaker cannot be plugged in or withdrawn from service position in closed condition.

   b) The breaker can only be operated either in TEST or SERVICE position and not permitted to operate in any other position in side the cubicle.

1.5 Each breaker shall have (for inter locking purpose in addition to auxiliary contacts)

   a) Position switch with 4 NO. & 4 NC Contacts.

   b) Auxiliary switch with 4NO & 4 NC contacts.

1.6 Breaker compartment shall be provided with a door, which can be closed with the breaker in any of the three positions namely ‘SERVICE’, ‘TEST’, and ‘ISOLATED’ position.

Warrantee: Two years from the date of successful commissioning at site.

Factory Inspection: Factory inspection and testing are to be arranged by the contractor for IIT officials by the contractor/ manufacturer

Erection: The contractors are liable to perform all the arrangement for erecting the PCC panel unit on MS channels including supply of iron channels of approx size 150 x 75 x 75 mm as approved by the Engineer and fixing them on cable trench with foundation bolts including supply of all hardware for complete execution of the job.
PLAN VIEW OF TRANSFORMER AND PCC PANEL FOR JC GHOSH AND P.C ROY Sc. BLOCK

- H T cable 3 core 95 Sq. mm x1R (25 Mtr each)
- L T cable 3.5 core 400Sq. mm x7R (300 Mtr each)
- SUB STATION -7
- Transformer Platform with LT PCC panel room
TITLE:
TENTATIVE LOCATION OF GF AHU ROOM, HVAC PLANT ROOM & COOLING TOWER AT JC GHOSH & PC ROY SCIENCE COMPLEX, IIT Kharagpur.
1) Foundation should be enclosed with wire fencing and grilled gate (3 Mtr). at front.
2) Roof should be shaded with aluminium sheet at proper height.
3) Location of the transformer should be near No 7 seisting sub station
NOTE: ALL Outgoing ACB, MCCB should have phase indication and ON, OFF, TRIP indication. All MFM should be with RS 485 communication port.
PLAN VIEW OF TRANSFORMER AND PCC PANEL FOR JC GHOSH AND P.C ROY Sc. BLOCK

----- H T cable 3 core 95 Sq. mm x1R (25 Mtr each)

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