



AN ISO 9001 & 14001 COMPANY

TENDER DOCUMENT

TENDER No: DLI / CON / 692 / 368

FOR

**Construction of Building for School of Engineering & Technology
(Academic Block –B) at Central University Campus at Manatu, Ranchi, Jharkhand**

VOLUME – II

Additional Conditions of Contract

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Technical Specifications

&

Tender Drawings

TENDER DOCUMENT (VOLUME-II)

ADDITONAL CONDITIONS OF CONTRACT

NIT NO. : DLI/CON/ 692/368

CONSTRUCTION OF BUILDING FOR SCHOOL OF ENGINEERING AND TECHNOLOGY,

**AT CENTRAL UNIVERSITY CAMPUS, RANCHI,
JHARKHAND**

ISSUED TO

Engineer in Charge

ENGINEERING PROJECTS (INDIA) LIMITED

(A GOVT. OF INDIA ENTERPRISE)

ADDITIONAL CONDITIONS OF CONTRACT (ACC)

1.	General
	The Additional Conditions shall be read in conjunction with General Conditions of Contract. Where the provision of these Additional Conditions are at variance with the provision of the General Conditions of Contract, the provisions of these Additional Conditions shall take precedence.
2.	Scope of Work
	The scope of work of the contract shall be "Civil, Plumbing, Sanitary, Internal Electrification and other allied works" (hereinafter referred to as "Works") as per Technical specifications, Drawings, BOQ, Instructions and Terms and conditions given in Tender Documents.
3.	Commencement and Completion of Project:
	The Contractual Completion Period shall be 12 (Twelve) months from the 10 th day of issue of Telegram /Letter/Fax of Intent of Acceptance of Tender.
4.	Bidders Confirmation
	Bidder confirms that they have read and understood and have copies of the 'Tender Documents' and have visited the site and their offer is based on the 'tender Documents' and caters to all the works, requirements, etc. thereof.
5.	References: CPWD specification with latest modification.
	In case of conflict, the more stringent requirement will apply unless ruled otherwise by EPI/CUJ.
6	Taxes and Duties
	All Taxes, Duties, Statutory levies such as VAT or any other similar Tax in the State concerned, Cess, Labour cess, Octroi, Entry Tax, Turn over Tax, Consignment Tax, Work Contract Tax, Service Tax, Toll Tax, Royalties, Levies and other Tax (es) or Duty (ies) etc as imposed by State / Central / Local Government Bodies from time to time for the Works, are included in the contract price. Income Tax and other Deductions of Taxes as applicable shall be effected from RA Bills / due payment of the contractor.
7	Witnessing of Tender
	The tender for the works shall not be witnessed by a contractor or contractors who himself / themselves has/have tendered or who may find has/have tendered for the same work. Failure to observe this condition would render, tenders of the contractors tendering as well as witnessing the tender, liable to summarily rejection.

8	Measurement of Work Done
	<p>Engineer-in-charge shall, except as otherwise provided, ascertain and determine measurement and the value in accordance with the contract work done.</p> <p>All measurement of all items having financial value shall be entered in Measurement Book and/or level field book so that a complete record is obtained of all works perform under the contract.</p> <p>All measurements and levels shall be taken jointly by EPI and by the contractor or his authorized representative at least once in a month during the progress of the .work and such measurements shall be signed and dated by EPI and the contractor in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.</p> <p>If the contractor or his authorized representative does not remain present at the time of measurements after the contractor has been given a notice three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement then such measurements recorded in his absence by EPI/CUJ shall be deemed be accepted by the Contractor.</p> <p>The contractor shall, without extra charge, provide all assistance with every appliance labour and other things necessary for measurements and recording levels.</p> <p>All work to be measured as per latest IS standards with up to date corrections.</p> <p>The contractor shall give not less than seven days notice to EPI before covering up or otherwise placing beyond the reach of measurement any work In order that the same may be measured and correct dimension thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and placed beyond reach of measurement any work without consent in writing from EPI / CUJ who shall within the aforesaid period of 7 days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or consent being obtained in writing the same shall be uncovered at the contractor's expense or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.</p> <p>EPI/CUJ may cause to check the measurement recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurement or levels.</p> <p>It is also a term of this contract that recording of measurements of any item of work in the measurement book and/or its payment in the interim, on account or final bill .shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement defects noticed till completion of the defects liability period.</p>

9	Insurance
	<p>Contractor is required to take Contractor's All Risk Policy or Erection All Risk Policy (as the case may be) including Marine Insurance from an Approved Insurance Company in the joint name with EPI and Central University, Jharkhand and bear all costs towards the same for the full period of execution of works including the defect liability period for the full amount of contract against all loss or damage from whatever cause arising for which he is responsible under the terms of the contract and in such manner that EPI and the Contractor are covered during the period of construction of works and/or also covered during the period of defect liability for the loss or damage as under:-</p> <ol style="list-style-type: none"> The work and the temporary works to the full value of such works. The materials, construction plant, centering, shuttering and scaffolding materials and other things brought to the Site for their full value. Whenever required by EPI the Contractor shall produce the policy or the policies of insurance and the receipts for payment of the current premiums.
	INSURANCE UNDER WORKMENN'S COMPENSATION ACT
	<p>Contractor is required to take insurance cover as per requirement of the Workmen's Compensation Act, 1923 amended from time to time from an Approved Insurance Company and pay premium charges thereof. Whenever required by EPI the Contractor shall produce the policy or the policies of Insurance and the receipt of payment of the current premiums.</p>
	THIRD CONTRACTOR INSURANCE
	<p>Contractor is required to take third CONTRACTOR insurance cover for an amount of 5% (five percent) of Contract Value from an Approved Insurance Company for insurance against any damage, injury or loss which may occur to any person or property including that of EPI, and Central University, Jharkhand arising put of the execution of the works or temporary works. Whenever required by EPI the Contractor shall produce the policy or the policies of insurance and the receipt of payment of the current premiums.</p> <p>In case of failure of the Contractor to obtain insurance for works, insurance under Workman Compensation Act and Third CONTRACTOR insurance as described above within one month from the date of commencement of work, running account payments of the Contractor shall be withheld till such time the aforesaid insurance covers are obtained by the Contractor.</p>
10	Contractor's Plant and Equipment
	<p>The CONTRACTOR shall deploy sufficient plant & equipment of the required capacity and in good working condition for completion of the works in stipulated time with required quality, the equipment should either be owned by the CONTRACTOR or hired/leased. The deployment of equipment by the CONTRACTOR shall be as decided by EPI/CUJ, for execution of works and as per schedule agreed with EPI. The CONTRACTOR shall make arrangement for regular maintenance including preventive and breakdown maintenance and maintain stock of essential spares at site/near to site so as to ensure minimum breakdown time of equipment. The equipment once brought to site shall not be</p>

	allowed to be removed without written permission of EPI. In case the CONTRACTOR fails to deploy sufficient equipment to the satisfaction of EPI or in case of prolonged breakdown of equipment, EPI/CUJ at its sole discretion shall take necessary action as deemed fit and decision of EPI/CUJ shall be final and binding on the contractor.
11	Discrepancies and adjustment of errors
	The Several documents forming the contract are to be taken as mutually explanatory to one another, detailed drawings being followed in preference to small scale drawings and figured dimensions in preference to scale and Additional Conditions in preference to General Conditions.
12	Order of Precedence
	In case of ambiguity in schedule of rates, General Conditions, Specifications, Drawings, the following order of precedence will prevail. <ul style="list-style-type: none"> i) Rate of DSR-2012 ii) Drawings iii) Bill of Quantities iv) Additional Conditions / Corrigendum v) Specifications vi) General Conditions of Contract
13	Conflict in Documents
	If there are varying or conflicting provisions made in anyone document forming part of the contract, the Engineer-in-charge of EPI shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the contractor.
14	Documents
	Documents required to be maintained at site, one copy of following: <ol style="list-style-type: none"> 1. Contract Document 2. All Drawings 3. Specifications 4. Corrigendum 5. Reviewed shop drawings 6. Site order book 7. Other modifications to contract 8. Field test reports 9. Copy of approved work schedule and its updated revisions as approved.
15	Security Deposit / Retention Money
	The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit EPI/ CUJ at the time of making any payment to him for work done under the contract to deduct a sum at 10% (Ten percent) from the gross amount of each running bill till full amount .of Security deposit of 5% (Five percent) (including EMD) of agreement value or value of work (whichever is higher) Is reached. .If value of work exceeds the agreement value; security deposit (5%) will be recovered for the exceeded work.

	<p>All compensations or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from or from any sums which may be due to or may become due to the contractor by CUJ on any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid. the contractor shall within 10 days make good in cash or fixed deposit receipt tendered by the State Bank of India or by Scheduled Banks or Government Securities (if deposited for more than 12 months) endorsed in favour of CUJ, any sum or Sums which may have been deducted from, or raised by sale of his Security Deposit or any part thereof.</p>
16	Registration
	<p>The CONTRACTOR confirms that it holds EPF Code number, CST-TIN, VAT – TIN/ Sales tax on Works contract number, Service tax registration number, PAN (Permanent Account Number of Income Tax) etc. and shall be responsible for depositing EPF subscription and contribution for labour and staff employed by it on the works and Service tax, other taxes, duties and dues etc. as per statutory requirements and documentary evidence of same shall be provided to EPI. The CONTRACTOR shall also be responsible for labour welfare and for arranging labour and other licenses/permits/clearance etc. for the project at their own. The CONTRACTOR shall comply with all the requirements as per labour laws/acts. All the records in this regard shall be maintained by the CONTRACTOR as per statutory requirements and rules and shall be produced by the CONTRACTOR on demand if required. In case, the bidders do not have PF Registration No & Sale Tax/VAT registration the same shall be obtained by successful bidder within one month from the date of LOI or before release of First RA Bill.</p>
17	Local Manpower
	<p>Successful Bidder shall ensure maximum utilization of local manpower as for as possible</p>
18	Association with EPI
	<p>If desired by EPI, the CONTRACTOR shall be available / associate with EPI in meetings with Client for its portion of work at their own cost. The CONTRACTOR shall furnish all information and clarifications as and when required by EPI/CUJ.</p>
19	Non interference with other works
	<p>The CONTRACTOR shall plan and execute the works in his scope of work in such a manner that the other works, connected with the works of the CONTRACTOR, but not included in the CONTRACTOR's scope of work, do not get affected/delayed.</p>

20	Compliance to statutory rules
	The CONTRACTOR shall ensure compliance with all Central, State and Local Laws, Rules, Regulations etc. as applicable or may be applicable during the course of execution, maintenance etc. of the works and shall indemnify against any claim or damages whatsoever on such accounts. The CONTRACTOR shall also keep EPI/CUJ indemnified at all times against infringement of any Patent or Intellectual Property rights.
21	Payment
	<p>The interim or running account bill shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format of EPI/CUJ in qua-duplicate on or before the date of every month fixed for the same by EPI / CUJ. In the event of the failure of the contractor to submit the bills, EPI shall prepare or caused to be prepared such bills in which events no claim whatsoever due to delays in payment including that of interest shall be payable to the contractor. Payment on account of amount admissible shall be made by EPI certifying the sum to which the contractor is considered entitled by way of interim payment at such rates as decided by EPI. The amount admissible shall be paid by 30th working day of presentation of the bill by the contractor to EPI together with the account of dismantled the materials if any.</p> <p>Any such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by EPI/CUJ relating to the work done or materials delivered forming part of such payment may be modified or corrected by any subsequent such certificates or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude determine or affect in any way powers of EPI under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.</p> <p>Pending consideration of extension of date of completion, interim payments shall continue to be made without prejudice to the right of EPI to action under the terms of this contract or delay in the completion of work, if the extension of date of completion is not granted by EPI/CUJ. The Contractor shall have no claim in case the payments are delayed due to any reason whatsoever.</p>
22	Compensation for delay
	If the contractor fails to maintain the required progress as mentioned in contract data or to complete the work and clear the site on or before the contract 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 as agreed compensation the amount calculated at the rates stipulated below as EPI may decide (whose decision in writing shall be final and binding) on the amount of tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in contract data or

	<p>that the work remains incomplete.</p> <p>i) Compensation for delay of work – at the rate of 2% per month of delay to be computed on per day basis.</p> <p>Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the contract amount.</p>
23	Work subject to audit
	<p>The work executed by the CONTRACTOR shall be subject to audit and quality control checks from Quality Control Division & Technical audit of EPI/CUJ, inspecting Agency of the Client and Chief Technical Examiner of Central Vigilance Commission, Govt. of India. In the eventuality of any defect/sub standard works as brought out in the report or noticed otherwise at any time during execution, maintenance period etc., the same shall be made good by the CONTRACTOR without any extra cost. In case the CONTRACTOR fails to rectify the defect/sub- standard work within the time period stipulated by EPI/CUJ, necessary action as deemed fit shall be taken by EPI/CUJ and decision of EPI/CUJ shall be final and binding on the contractor.,</p>
24	False statement
	<p>In case, at a later stage, it is found that the CONTRACTOR has submitted incorrect, false details and credentials resulting in apprehensions on the capabilities of CONTRACTOR with regard to quality & timely completion of works, financial capabilities etc. EPI/CUJ can terminate this agreement solely at their option. In this eventuality the CONTRACTOR shall be liable for the losses suffered by EPI/CUJ and further CONTRACTOR shall have no claim on EPI/CUJ, whatsoever.</p>
25	Statutory Approvals
	<p>The contractor is responsible for obtaining all statutory approvals during construction and thereafter. Necessary liasoning to be undertaken wherever required with no extra claim. All the approvals shall be taken before the scheduled completion period and in any case before the work can be taken over.</p>
26	Price Escalation
	<p>No escalation is applicable in this contract.</p>
27	Additional / Extra Items
	<p>The following procedures shall be meticulously adopted in case of any additional / extra items.</p> <p>i) EPI shall issue a Contemplated Change Notice (CCN) in the format enclosed as Annexure.</p> <p>ii) Based upon the requirement stipulated in CCN contractor shall submit analysis to reflect financial implications if any, within 7 days from issue of CCN. The price analysis shall be based upon rates given in bill of items for the similar works or can be derived on the basis of basic rate of</p>

	<p>material and labour appended with annexure, in case the item is not available in bill of items/ DSR-2012.</p> <p>iii) After review and approval of analysis by Engineer In-charge of EPI / CUJ, change order shall be issued by EPI in the format enclosed with the annexure to enable contractor to execute item. For the purpose of cost analysis the following procedures applies :</p> <p>iv) For substitute items contractor shall produce price analysis for the approval of EPI / CUJ and adjustment in the contract amount accordingly. No overheads and profits shall be applicable against substituted items.</p>
28	Variation
	The variation limit shall be $\pm 50\%$ of the value of Contract for works within the site and of similar nature and specification at the same accepted rate. There is no limit of variations for individual Items.
29	Codes
	<ol style="list-style-type: none"> 1. Applicable British Standard (B.S)/ Indian Standards (IS) and in the absence of definite provision on particular issue in the specification / codes, reference may be made to relevant latest Codes recommended to be used and good engineering practices and / or as per instruction / suggestion of EPI / CUJ. 2. Wherever applicable / instructed by EPI / CUJ, strict compliance to 'GRIHA' manual is mandatory for the contractor for execution of work.
30	Safety Measures
	It shall be the sole responsibility of the Contractor to ensure all safety measures giving proper, prior notices etc. and obtaining prior permission from concerned local authorities as per bye-laws or directions issued by them at his own cost. No claim of the contractor in this regard shall be entertained. Proforma of Safety Measures (to be provided by EPI) shall be attached along with each bill duly filled by the contractor and certified by EPI.
31	Design Mix
	The CONTRACTOR is required to submit his design mix for various grades of concrete for approval of EPI/CUJ keeping in view the requirement stipulated in the technical specification and relevant codes.
32	Materials to be provided by the contractor
	<p>The contractor shall at his own expense, provide all materials, required for the works.</p> <p>The contractor shall at his own expense and without delay supply to EPI samples of materials to be used on the work and shall get approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specification laid down or referred to in the contract. The contractor shall if requested by EPI furnish proof to the satisfaction of EPI that the materials so</p>

	<p>comply. EPI shall within 15 days of supply of samples or within such further period as he may require intimate to the contractor in writing whether samples are approved by them or not. If samples are not approved the contractor shall forthwith arranged to supply to EPI for his approval fresh samples complying with the specifications laid down the contract. When materials are required to be tested in accordance with specifications approval of EPI/CUJ shall be issued after the test results are received.</p> <p>The contractor shall, at his risk and cost, submit the samples the materials to be tested or analysis shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by EPI. The contractor shall not be eligible for any claim or compensation either arising any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.</p> <p>The contractor shall at his risk and cost make all arrangements and shall provide all facilities as EPI may require for collecting and preparing the required nos. of samples for such tests at such time and to such place or places as may be directed by EPI and bear all charges and cost of testing. EPI / CUJ shall at all time have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access.</p> <p>EPI shall have full powers to require the removal from the premises of all material's which in their opinion are not in accordance with the specifications and in case of default EPI shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. EPI shall also have full powers to require other proper materials to be substituted thereof and in case of default EPI may cause the same to be supplied and all costs which may attain such removal and substitution shall be borne by the contractor.</p>
33	Sub-standard Material
	Any material/item/fitting/fixtures rejected by EPI / CUJ shall be removed from the site within 48 hours of issue of instructions to this effect by EPI. Failing this, the EPI shall have the rights to get these removed and the Contractor shall have no claim whatsoever in this regard.
34	<p>Alterations, Additions and Omissions</p> <p>EPI/CUJ can make any variation of the form, quality or quantity of the works or any part thereof that may, in their opinion be necessary and for that purpose, or if for any other reason it shall in his opinion be desirable, they shall have power to order in writing to the contractor to do and the contractor shall do any of the following :</p> <p>i) Increase or decrease in the quantity of any work included in the contract in which case the value of contract may be increased or decreased.</p>

	<ul style="list-style-type: none"> ii) Omit any such work. iii) Change the levels, .lines, position and dimension of any part of the works and iv) Execute additional work of any kind necessary for the completion of the works and no such variation shall in any way vitiate or invalidate the contract, but the value, if any of all such variations shall be taken into account to ascertain the amount of the Contract Price. v) The contractor shall not effect any of the aforementioned changes without the written order of EPI / CUJ.
35	Sign Board
	Contractor will arrange to fabricate and erect sign board at his own cost showing name of work, name of CUJ, name of Architect/Consultants, name of EPI, date of commencement and completion etc of size and design as approved by EPI/CUJ.
36	Dismantled Material
	The contractor shall treat all materials obtained during dismantled of structure, excavation of the site for a work etc as the property of CUJ and such materials shall be disposed off to the best advantage of CUJ according to the Codal provision.
37	TIME ESSENCE OF CONTRACT & EXTENSION FOR DELAY
37.1	<p>The time allowed for execution of the Works as specified in the terms of contract or the extended time in accordance with these conditions shall be the essence of the contract. The execution of the works shall commence from the 10th Day of the date of letter of Intent If the Contractor commits default in commencing the execution of the work as aforesaid, the Executing Agency shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the security deposit money absolutely.</p> <p>Within 7 (Seven) days 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 of the works (Schedule D of Contract Data). 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 stipulated in the Contract documents. The physical report including photographs shall be submitted by the Contractor on the prescribed format & the intervals (not exceeding a month) as decided by the Engineer in Charge. The compensation for delay as per Clause - 23 shall be leviable at intermediate stages also, in case the required progress is not achieved to meet the above time deadlines of the completion period and/ or milestones of time and progress chart.</p>

	market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).
(b)	If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).
40	Deviation, Deviated Quantities, Pricing
(a)	In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in Clause -29, the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis. for the work in excess of the above mentioned limits; provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities the Engineer-In-Charge of EPI shall within one month of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates/other prevailing codes as approved by CUJ and the contractor shall be paid In accordance with the rates so determined.
(b)	The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in Clause-29 and the Engineer-in-Charge of EPI shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of receipt of the notice, revise the rates for the work in question within one month of expiry of the said period of fifteen days having regard to the market rates or current schedule of rate or other prevailing codes as approved by CUJ.
(c)	The contractor shall send to the Engineer-In-Charge once every three months an up to date account giving complete details of all claims for additional payments to which the contractor may consider himself entitled and of all additional work ordered by the Engineer-in-Charge of EPI which he has executed during the preceding quarter failing which the contractor shall be deemed to have waived his right.
41	Action in case work not done as per Specifications
	All works under or in course of execution or executed in pursuance of the contract shall at all times be open and accessible to the inspection and supervision of the Engineer-in-Charge, his authorized. representative in charge of the work and all the superior officers, officer of the Quality Control Organization of EPI / CUJ and of the cabinet (Technical) Vigilance, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to

	<p>the Contractor either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose, Orders given to the Contractor's agent shall be considered to have the same force as they had been given to the contractor himself.</p> <p>if it shall appear to the Engineer-In-charge of EPI or his higher authority or his authorized subordinates in charge of the work or to the Cabinet (Technical) Vigilance or his subordinate officers, that any work has been executed with unsound, imperfect. or unskillful workmanship, or with materials or article provides by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not In accordance with the contract the contractor shall, on demand in writing which shall be made within the period specified by the Engineer-in-charge of EPI/CUJ , materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the contractor, failing do so within a period specified by the Engineer-in-Charge of EPI in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause - 23 of ACC of the contract (for non-completion of the work in time) for this default.</p> <p>In such case the Engineer-in-charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the competent authority may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure and incidental items rectified, or removed and re-executed at the risk and cost of contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the contractor.</p>
42	<p>Contractor Liable for Damages, defects during maintenance period</p>
	<p>If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any building, road, road curb, fence, enclosure, water pipe, cables, drains, electric or telephone post or wired, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within defect liability period after a certificate final or otherwise of its completion shall have been given by the Engineer-in-charge of EPI as aforesaid arising out of defect or improper materials or workmanship the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-charge of EPI cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient option thereof. The security deposit of the contractor shall not be refunded before the expiry of defect liability period after the issue of the certificate final or otherwise, of completion of work, or till the final bill has been prepared and passed</p>

	<p>whichever is later.</p> <p>In case of Maintenance and Operation works of Electrical & Mechanical services, the security deposit deducted from contractors shall be refunded within one month from the date of final payment or within one month from the date of completion of the defect liability period whichever is earlier</p>
43	Recovery against Labour Safety
	In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at his own expense arrange for the safety provisions as per CPWD Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. Failing which, necessary action as deemed fit shall be taken by EPI/CUJ.
44	Compensation
	All Sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of Government without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.
45	Approval of Engineer-in-charge
	All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer-In-Charge who shall be entitled to direct at what point or points and In what manner they are to be commenced, and from time to time carried on.
46	Contractor to indemnify Govt. against Patent Rights
	The contractor shall fully indemnify and deem indemnified EPI/CUJ against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under the action brought against EPI/CUJ in respect of any such matter as aforesaid the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expenses, to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify EPI/CUJ if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge of EPI/CUJ in this behalf.
47	Unfiltered water supply
	The contractor(s) shall make his / their own arrangement for water required for the work and nothing extra will be paid for the same, This will be subject to the following conditions.
i)	That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Engineer-in-Charge of EPI/CUJ.

ii)	The Engineer-in-charge of EPI shall make alternative arrangements for supply of water at the risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the option of the Engineer-in-Charge of EPI/CUJ, unsatisfactory.
48	Levy/Taxes payable by Contractor
i)	The contractor shall deposit royalty and obtain necessary permit for supply of the red earth, moorum, sand chips bajri, stone, kankar, etc. from local authorities.
ii)	If pursuant to or under any law, notification or order any royalty, cess of the hike becomes payable to the Government of India and does not at any time become payable by the contractor to the State Government/Local authorities in respect of any material used by the contractor in the works then in such a case, it shall be lawful to the Government of India and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from the dues of the contractor.
49	Conditions for reimbursement of levy/taxes if levied after receipt of tenders
i)	All tendered rates shall be inclusive of all taxes and levies payable under respective statutes. However, pursuant to the Constitution (46th Amendment) Act, 1982, if any further tax or levy is imposed by Statute, after the last stipulated date for the receipt of tender including extensions if any and the contractor thereupon necessarily and properly pays such taxes/levies the contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of Engineer-in-charge of EPI(whose decision shall be final and binding on the contractor) attributable to delay execution of work within the control of the contractor.
ii)	The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by EPI as may be required from time to time.
iii)	The contractor shall, within a period of 30 days of the imposition of any such further tax or levy, pursuant to the Constitution (Forty Sixth Amendment) Act 1982, give a written notice thereof to the Engineer-in-Charge of EPI that the same is given pursuant to this condition, together with all necessary information relating thereto.
50	Release of Retention Money:-
	The entire Retention Money along with EMD amount shall be released to the contractor after 28 days of expiry of defect liability period.
51	Contractor's risks
	All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the

	contract other than the excepted risks are the responsibility of the contractor.
52	Covering up of Contract Works
	<p>No part of the contract works shall be covered up without the approval of the EPI/CUJ and the contractor shall afford full opportunity for examination and inspection by EPI / CUJ.</p> <p>The Contractor shall give due notice to EPI about the works to be covered up for their measurement and examination. EPI shall within a reasonable time attend for the purpose of examining such work, unless the contractor is specifically advised in writing of EPI's willingness not to attend such examination in which case the contractor may proceed further with contract works.</p>
53	Site Order Book
	The contractor shall maintain a site order book at site of the work. Any special orders and instructions to be issued to the contractor at site will be recorded in this book which will be numbered and initialed by EPI/CUJ. The contractor will however sign all the orders as a token of information received by him and take action accordingly.
54	Inspection and Testing
	<p>As and when required by EPI / CUJ, the contractor shall provide all facilities for inspection of contract works and materials at his own cost.</p> <p>All materials shall be of highest standard, quality and kind. All requisite cost as per IS/Tender stipulations are to be carried out by the contractor at his own cost and results submitted to EPI. This, however, does not absolve the contractor from his responsibility for the overall quality, kind, strength and stability of the structures.</p>
55	Safety, Security and protection of the Environment
	The Contractor shall, throughout the execution and completion of the works and the remedying of any defects therein:
56	Guarantee
	<p>All guarantees and test certificate for the entire work shall be transferred to EPI/CUJ by the contractor on virtual/interim completion of the work.</p> <p>All guarantees shall be for the values and duration as mentioned in specification/item description.</p>
57	Language
	All correspondence, drawings and notations relating to this Contract must be in English.

58	Water Supply
	The contractor shall make their own arrangements for water required for construction as well as for drinking and other purposes for their staffs and labour and the personnel of EPI / CUJ.
59	Electricity
	<ul style="list-style-type: none"> i) Contractor shall obtain temporary power connection from Local Authorities at his cost for construction purposes. ii) Contractor shall make his own arrangements for further distribution as per their requirement and also the requirement of EPI and cost of cables switches, fuses, meters etc. shall be borne by contractor. It is to be noted that power from local authority may not be continuous and there may be possibilities of disruption of power. Hence contractor shall install sufficient number of generators of adequate capacity duly approved by EPI/CUJ bearing all operating and installation cost right from the date of commencement of the work in the scope of the contractor. iii) EPI/CUJ reserves the right to supply power at mutually agreed rates as and when sufficient availability of same is attained. Till such time the contractor shall be required to supply power to EPI/CUJ/such vendors as EPI /CUJ desires at mutually agreed rates. iv) Contractor shall provide power free of cost to the temporary office facilities of EPI, CUJ, Consultant as required.
60	Gate keeper & Watchman
	The Contractor shall provide, maintain at his own expense gate keepers and watchmen to ensure at all times effective protection of the works, materials and workmen, until completion of the project, at his own risk and cost.
61	Recovery
	Any amount found recoverable from the contractor shall be recovered without prejudice to any other mode of recovery.
	In case of difference or ambiguity in Hindi an English version the English version will prevail.
62	Approval from Client The CONTRACTOR shall be responsible for obtaining all approvals from EPI/ Client with regard to quality of materials & workmanship and measurements etc. the work.
63	Contractors Use of Sites
	The Contractor is restricted to construction sites as marked on the drawings for the execution of the work. Contractor must obtain approval from EPI before

	proceeding with work outside.
64	Project Meetings
	<ol style="list-style-type: none"> 1. Hold project meetings at times and locations approved by EPI/CUJ. 2. Notify participants of meetings. 3. Contractor shall record minutes of meetings and distribute to participants within 3 days of meeting.
65	Setting Out of Work
	<ol style="list-style-type: none"> 1. Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated. 2. Provide devices needed for layout and construction work. 3. Supply stakes and other survey markers required for laying out work. 4. The Contractor has to arrange full time Survey team along with total station and other tools for checking of all co-ordinates/position of all items during execution.
66	Location of Equipments and Fixtures
	<ol style="list-style-type: none"> 1. Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate. 2. Locate equipment, fixtures and distribution systems to provide .minimum interference and maximum useable space and in accordance with manufacturer's recommendations for safety, access and maintenance. 3. Inform EPI of impending installation and obtain their approval for actual location. 4. Submit field drawings to indicate relative position or various services and equipment when required by EPI/CUJ.
67	Concealment
	Contractor shall conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.
68	Cutting & Patching
	<ol style="list-style-type: none"> 1. Contractor shall obtain approval of EPI/CUJ before cutting, boring or sleeving load- bearing members. 2. Cut and patch as required to make work fit. 3. Make cuts with clean, true, smooth edges. 4. Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.
69	Billing Documents
	<p>Following documents shall be enclosed by contractor along with submission of each bill otherwise the same shall not be accepted by EPI for checking and certification of payment.</p> <ol style="list-style-type: none"> a. Monthly progress reports in the format as issued by EPI/CUJ– the Sample report is available with EPI/CUJ for Contractor's reference. b. Cube test reports. c. Safety measurement certificate. d. All the information/documents contained in relevant check lists. Formats for

	(b), (c) and (d) shall be provided to the contractor by EPI.
70	Brand Name
	The specific reference in the Specifications and documents to any material by trade name, make or catalogue number shall be construed as establishing standard or quality and performance and not as limited competition. However, contractor may offer other similar equipments/material, provided it meets the specified standard design & performance requirements subject to approval by EPI / CUJ.
71	Co-ordination Drawings
	This is a Percentage Rate base contract. Therefore it shall be the Contractors responsibility to ensure complete co-ordination between works of various agencies such as Civil, Electrical, Utilities, and Plumbing etc. The Contractor shall deemed to have considered this aspect carefully while quoting percentage.
72	Site Meetings
	Site meetings shall be held at regular intervals and in addition to other meeting required by EPI/CUJ. There shall be at least one site meeting per fortnight in the presence of EPI/CUJ to discuss and co-ordinate the work. The Contractor shall provide responsible member of his organization who is authorized to commit and bind the contractor to any agreement reached during said meeting.
73	Submission of Manuals / Catalogues
	Maintenance manuals, product catalogues, all warranties and guarantees against each section of work shall be submitted hardbound in triplicate on completion as per direction of EPI.
74	Shop Drawings
	The Contractor shall submit shop/fabrication drawings for all services and works like Aluminium /Structural steel works /Electrical Conduit Layout etc as required and desired by EPI/CUJ. Nothing extra shall be paid on this account.
75	Measures to be followed for protection and preservation of landscape
	a) Avoid or limit major construction activity during monsoon season to minimize and avoid soil erosion due to rain fall.
76	Plan to be submitted
	Contractor to submit a construction activity, material storage and vehicular movement plan before starting construction and submit the same for EPI/CUJ/GRIHA consultant approval. The plan is to be prepared to ensure the following and is to be applied effectively during the whole construction phase:- i) Demarcate area on the site plan to which the site activities would be limited during construction by the contractor. The demarcated area

	<p>should be separated from the rest of the site through a physical barrier.</p> <p>ii) Construction materials such as sand, aggregate etc. to be stored in demarcated areas within low height enclosures to limit spillage, waste and site contamination due to winds.</p> <p>iii) Control plan clearly stating measures to stop and contain spills, to dispose off contaminated material and hazardous waste (hazardous waste include pesticides, paints, cleaner and petroleum products etc.) cover all loose stored material with geo-textile or any impervious fabric/covering.</p> <p>iv) Location should be identified on the construction site to store the used/scrap wastes. Both these wastes should be separately stored in Bins and handed over to authorized agencies for safe disposal.</p>
77	Preservation of tree/vegetation
	Existing trees and other forms of vegetation to be preserved by avoiding disturbance/damage due to construction activities. All existing vegetation should be marked on the site survey plan. The tree survey must be carried out and data must be recorded before starting construction activities. Adequate fencing to avoid disturbance / damages to trees/other vegetation to be provided.
78	Top Soil Preservation
	Adequate measures to excavate, preserve, maintain fertility and lay back top soil for minimum compacted depth of 300mm as per GRIHA consultant guidelines to be followed by the contractor.
79	Sanitation/safety facilities for construction workers
	Provision for basic facilities of sanitation & drinking water and safety construction works, safety of equipment and machinery etc. as per the various guidelines laid down in the National Building Code 2005 for construction safety for construction workers and for Health and Sanitation facilities for workers/working residing on site. This to include, but not limited to, safety equipment (safety helmets, jackets, boots, gloves etc), safety nets/harnesses, appropriate warning/safety signs, fire extinguishers, adequate light for working during evenings/nights, regular maintenance and repairs of machinery/equipments and adequate sanitation/potable drinking water facilities.
80	Controlling Air Pollution
(i)	Provide action plan to reduce and restrict Air Pollution during construction. Necessary measures such as hoarding/sheeting/dust screens around site/construction area, mulching/gravel stoning of pedestrian movement paths, limit vehicular movement paths/ parking areas (which should be hard paved or graveled) spraying water etc. to reduce dust pollution on site to be submitted

	for EPI/CUJ / GRIHA consultant approval and to be effectively followed during construction phase.
(ii)	Vehicles with dusty loads to be covered with impervious sheeting before they enter or exit the site.
(iii)	All Gensets used should meet recommended pollution norms and should be maintained properly. Min. stack height based on building height and DG Set capacity to be provided and spillage of fuel/lubricant to be controlled.
81	Testing Laboratory Services
	Particular requirements for inspection and testing to be carried out by testing laboratory designated by EPI/CUJ are specified under various sections.
	Where tests or inspections by designated laboratory reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspections as EPI may require to verify acceptability of corrected work.
82	Contractor's Responsibilities
	<ol style="list-style-type: none"> 1. Furnish labour and facilities to: <ol style="list-style-type: none"> i) Provide access to work to be inspected and tested. ii) Facilitate inspections and tests. iii) Make good work disturbed by inspection and test. iv) Provide storage on site for laboratory's exclusive use to store equipment and cure test samples. v) Provide all test equipments required for carry out field tests. 2. Notify EPI sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test. 3. Where Materials are specified to be tested, deliver representative samples in required quantity to testing laboratory. 4. Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by EPI/CUJ.
83	House Keeping
	General :
	1. Conduct cleaning and disposal operations to comply with local dinances and antipollution Jaws.
	2. Store volatile waste in covered metal containers and removc from prmises at the end of each working day.
	3. Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
	Materials :
	Use only cleaning materials recommended by manufacturer of surface to be cleaned and as recommended by cleaning material manufacturer

	Cleaning during :
	<ul style="list-style-type: none"> i) Provide on-site containers for collection of waste materials and debris ii) Dispose of waste materials and debris off site. iii) Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems
	Final Cleaning :
	<ul style="list-style-type: none"> i) Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials, from interior and exterior finished surfaces including glass and other polished surfaces. ii) Clean lighting reflectors, lenses and other lighting surfaces. iii) Broom clean paved surfaces: rake clean other surfaces of grounds. iv) Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
84	Project Record Documents
	<p>Record Drawings (As built drawings)</p> <ul style="list-style-type: none"> i) Contractor shall provide four sets of as built drawings. One set shall be reproducible transparency on plastic film and two cp's. The above requirements are apart from the requirement of municipal authorities, which are also to be met by the Contractor. ii) Maintain project record drawings and record accurately deviations from Contract documents. iii) Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection by Engineer, neatly transfer notations to second set and submit both sets to EPI. iv) Record following information: <ul style="list-style-type: none"> a. Depths of various elements of foundation in relation to datum. b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement. c. Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure. d. Field changes of dimension and detail. e. Changes made by Site Order/CCN. v) The above set of as built drawings shall be submitted before submission of final bill.
85	Construction Photographs
	1. General

	Provide construction photographs in accordance with procedures and submission requirements specified in this Section.
	<p>2. Progress Photographs</p> <p>a. Sizes: 200x300mm.</p> <p>b. Type: Gloss and colour.</p> <p>c. Paper: Single weight, unmounted.</p> <p>d. Number of prints required: 3 sets.(EPI / Client / Consultant)</p> <p>e. Identification: Typewritten name and number of project and date of exposure on 25x.50mm white patch in upper right hand corner</p> <p>f. Viewpoints: Interior and exterior location: viewpoints determined by EPI.</p> <p>g. Frequency: Monthly with progress statement or as an when instructed by EPI.</p>
	<p>3. Final Photographs</p> <p>i) Sizes: 200x300mm.</p> <p>ii) Type: Gloss and colour.</p> <p>iii) Paper: Single weight, unmounted.</p> <p>iv) Number of prints required: 4 sets.</p> <p>v) Identification: Typewritten name and number of project and date of exposure on reverse side.</p>
	<p>4. Number of viewpoints:</p> <p>i) Each side of buildings for total of 4 for each building.</p> <p>ii) Interior of rooms and finishes for total of 8 for each building.</p> <p>iii) Locations of viewpoints determined by Engineer-in-charges.</p>
86	Only approved make of OPC/Specified Cement to be used. In case of use of other makes in exceptional circumstances, that too after prior written approval of EPI/ CUJ, the recovery at prevailing market rates shall be made.
87	Employment of Technical Staff and employees
	Contractors Superintendence, Supervision, Technical Staff & Employees
i)	<p>The contractor shall provide all necessary Superintendence during execution of the work and as along thereafter as may be necessary for proper fulfilling of the obligations under the contract.</p> <p>The contractor along with bidding of the tender , intimate in writing to the Engineer-in-Charge of EPI the name, qualifications, experience, age, address and other particulars along with certificates, of the technical representative to be in charge of the work. If there is any change then the new documents qualifications and experience shall be submitted by the contractor. The Engineer-in-charge of EPI shall within 15 days of issue of letter of acceptance intimate in writing his approval or otherwise it is deemed to be approved. Any such approval may at any time be withdrawn and in case of such withdrawal the contractor shall appoint another such representative according to the provisions of this clause. Decision of EPI shall be final and binding on the contractor in this respect.</p>

Requirement of Technical Staff for the work					
Cost of work (Rs. In lakh)	Contract period (Months)	Requirement of Technical Staff		Minimum experience (Years)	Designation
		Qualification	Number		
More than 1000	12	(i) Project Manager with degree in corresponding discipline of Engineering	1	10	Principal Technical Representative
		(ii) Graduate Engineer	1	5	Technical Representative
			2	Nil	Technical Representative
		(iii) Graduate Engineer OR	2	5	
		Diploma Engineer	1	5	Technical Representative
		(iv) Planning / Quantity Surveyor			

Rate of recovery in case of non compliance of above be stipulated at following rates:-

Sl No.	Qualification	Experience (years)	Rate of recovery
(i)	Project Manager with Degree	10	Rs. 25,000/-p.m.
(ii)	Graduate Engineer	5	Rs. 20,000/- p.m.
(iii)	Graduate Engineer or Diploma Engineer	NIL 5	Rs. 12,000/- p.m.
(iv)	Planning / Quantity Surveyor	5	Rs. 15,000/- p.m.

CONTEMPLATED CHANGE NOTICE

To	Submit Quotation to :	Project No.
Contractor		CCN No
Sub :		Date

It is proposed to make the following change in the work. You are requested to quote a firm price for any revision to the contract amount arising from the change. No work should be undertaken on this change until a change order / written authorization has been signed and issued.

Quotation to be submitted with 7 days of the date of this notice.

The work shall conform to the contract documents where applicable unless otherwise stated.

Initiator

Reason for Change _____

CHANGE ORDER

Project No.

Change Order No.

Location

Description : Construction of Building for School of Engineering and Technology, at Central University Campus, Ranchi, Jharkhand

Project Management Consultant : - M/s EPIL
Architect : - M/s SPACE ACE

Contractors Name and Address

Original Contract	Amount of	Approved Amount to Date	C.O.	Present Amount	C.O.	Revised Amount	Contract
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Description of Change – Refer CNN No.

Recommended by: M/s EPIL

Approved by: OSD (Projects), CUJ/B.C. (CUJ)

TENDER DOCUMENT (VOLUME-II)

(Scope of Works, Technical Specification)

NIT NO. : DLI/CON/692/368

CONSTRUCTION OF BUILDING FOR SCHOOL OF ENGINEERING AND TECHNOLOGY, AT CENTRAL UNIVERSITY CAMPUS, RANCHI, JHARKHAND

ISSUED TO

ENGINEERING PROJECTS (INDIA) LIMITED
(A GOVT. OF INDIA ENTERPRISE)

1.1 Information about the site :

The site for Proposed Academic Block-2 is located in Manatu, Ranchi at about 25 KM from Ranchi, Jharkhand. The site is having rocky strata and undulation . All tenders are advised to visit the site and collect necessary information from site with prior approval from EPIL prior to submission of the tender.

1.2 SCOPE OF WORK

. The scope of this contract is Construction of Academic Block-2. The scope of work covers the entire construction including the followings:

1. Civil and Structural works for the main building.
2. Complete Internal and External Finishing Works
3. Internal and External Electrical works.
4. Internal and external Sanitary, water supply and drainage works.
5. Fire fighting and Prevention systems.
6. UGR, Septic Tanks, etc. .
7. Other misc. works as required for making the building functional.

The scope of work covers the entire construction work as stipulated above and as mentioned in BOQ/ drawings/ specification and handing over the project to EPIL /Client.

1.0 GENERAL SPECIFICATION

2.1 The work in general shall be carried out as per CPWD specifications, 2009 (volume I to IV) (updated with correction slips issued up to last date of submission of tender), general specification 2005 for Electrical works (updated with correction slips issued up to last date of submission of tender).

2.2 All Electrical installation shall comply with the requirements of Indian Electricity rules, 1956 and Indian Electricity Act-1910 as amended up to date and bye laws of authority of State Government or any other department.

2.3 All mechanical works related to Public Health Engineering will conform to the requirements of manual of Water Supply by the Ministry of Urban Development and various Indian Standards as listed there-in.

2.4 All electrical works will conform to various Indian Codes as listed in the Technical Specifications.

2.5 For the items not covered under the specifications as stated above, the work shall be done as per relevant IS Codes.

2.6 For the items not covered under any of the specifications stated above, the work shall be executed as per Manufacturer's specifications/ General Engineering Practice and / or as per direction of Engineer in Charge.

2.0 ADDITIONAL PARTICULAR SPECIFICATION

In the absence of any definite provisions or any particular issue in the aforesaid specification, reference to be made to the latest codes and specifications of BIS, IRC, BS and ASTM in that order. Where even these are silent, the construction and completion of works shall conform to sound Engineering practice as approved by Engineer in Charge. In case of any dispute arises out of the interpretation of the above, the decision of the Engineer in charge shall be final and binding on the contractor.

Where ever reference is made in the contract to specific standard codes to be met by the materials, plants and other supplies to be furnished and work performed and tested, the latest edition or revision of the relevant codes in effect shall apply, unless otherwise explicitly stated in the contract. Where such standards and codes are national, or related to a particular country of region, other internationally recognized standards which ensure a substantially equal or higher performance than the standards and codes specified will be accepted subject to the Engineer in charge prior review and written approval. Differences between standards must be fully described in writing by the contractor and submitted to the Engineer in Charge at least 15 days prior to the date when contractor desires the Engineer in Charge's approval. If the Engineer in Charge determines that such proposed deviation do not ensure substantially equal performance, the contractor shall comply with the standards specified in the documents.

3 PARTICULAR SPECIFICATION OF ITEM OF WORKS NOT COVERED IN SPECIFICATION MENTIONED ABOVE.

3.1 FILLING WITH LOCALLY AVAILABLE SAND

Sand should spread in uniform layer of 150mm thickness and each layer shall be watered up to the full saturation condition and each layer to be compacted

with manual / mechanical compacting device to achieve maximum density. After completion of the full depth of filling the surface of the filled sand to be neatly dressed and leveled.

3.2 SINGLE BRICK FLAT SOLING

Brick for soling should be of picked jhama quality of uniform size and shape. The under bed to be properly rammed and leveled before laying of soling. The joints between the bricks shall be filled with local sand (or available earth, if permitted by Engineer in Charge).

3.4 EXPANSION JOINT SEALANT

The specified gap of the expansion joint to be made uniform by cement mortar of appropriate strength, after curing is over, the mortar surface to be cleaned from all dust, dirt, lump of mortar, any grease materials etc. The depth of the expansion joint to be adjusted as per specified depth with suitable filler board. The surface of the expansion joint to be painted with manufacturer's approved primer. Polysulphide based sealant compound shall be used as per specified width X depth to seal the joint. The total process of execution shall be as per manufacturer's specification and instruction of Engineer in Charge.

Water used for manufacture of concrete or cement-sand mortar shall be clean and free from injurious amounts of oils, acid, alkali, salt, sugar, organic materials or other substances that may be deleterious to concrete or steel as detailed in clause 4.3 of I.S. 456 – 2000

4 PARTICULAR TECHNICAL SPECIFICATION FOR ELECTRICAL WORK

4.1 SCOPE

This specification covers supply of materials, fabrication, and erection, testing and commissioning of Electrical Switch boards, wiring system, light fittings and other associated items required for successful completion of the work. Any equipment, device, component or work not specifically mentioned in this specification but considered essential for proper design and operation shall be included by the tenderer in his offer. Applicable provisions and conditions of contract shall govern the work under the Section.

4.2.GENERAL

The power supply system in the buildings shall be of 415/240 Volts, 50 Hz., A.C. 3 phase 4 wire, earthed neutral system.

All supply and installation work shall be carried out as per specification and in accordance with the construction drawings and shall conform to requirements called for in the Indian Electricity Rules 1956 with its latest amendment, Indian Electricity Acts and all relevant codes and practices issued by the Bureau of Indian Standard as amended up-to-date. The work shall also comply with the provisions of the general or local set of legislatures and regulations of any local or other statutory authority which may be applicable.

The Contractor for electrical work must possess valid Electrical contractor's License endorsed by the Licensing Board, Directorate of Electricity of concerned State Government for the type of work he shall execute.

The work to be provided for by the Contractor, unless otherwise specified, shall include but not limited to the following :

i: Furnish all labour, supervision, services, materials, supports, scaffolds, construction equipment, tools, plants and transportation etc required for the proper execution of the job as per drawings, specification and schedule of items and get all necessary tests on materials and work conducted at their cost.

ii: Notwithstanding the electrical layout shown in the drawing, the contractor shall obtain further approval of the layout at site from the Engineer-in-Charge before commencement of the work.

iii: Furnish samples of materials on display board at site for approval including arranging necessary tests on samples, as directed by the Engineer-in-Charge in an approved Laboratory.

iv: To extend facilities to the Engineer-in-Charge to inspect work and assist them to obtain samples, if they so desire.

v: Furnish general arrangement drawings of the switchboard and other fabrication items, which the Engineer-in-Charge may direct for their approval.

vi: To employ a full time experienced supervisor having electrical supervisor's certificate of competency endorsed by the Licensing Board, Directorate of Electricity of concerned State to supervise the work. The Engineer-in-Charge have the right to stop the work if the contractor's supervisor is not present when the work is being carried out.

vii: To keep the appropriate Electrical Inspector & supply authority be informed from time to time as per the execution programme of the work shall be the responsibility of the contractor and he shall be responsible to ensuring that all work passes their approval.

viii: To provide all incidental items not shown or specified in particular but necessary for proper execution of works in accordance with the drawing, specification and schedule of items.

ix: To maintain the work and keep them maintained till handed over to the owner in proper working condition.

x: Co-ordinate with all agencies including those engaged by the owner for proper execution of the job.

4.3 MATERIALS

Materials shall be of the approved make & quality. A list of materials of approved brand and manufacturer is indicated in the annexure. If the list of materials mentioned above stipulates two or more or alternative brands/makes of any product, the decision as to which brand/make shall be used in the work shall be taken by the Engineer in charge and the contractor shall provide the brand/make so selected without any extra cost.

In case, materials are required to be obtained from any manufacturer other than those listed on account of non-availability then prior approval from Engineer-in-Charge will be necessary, supported by relevant test certificates qualifying the required standard. Further tests as directed by the Consultant shall also be carried out by the contractor at their own cost, if required.

Contractor shall obtain approval from the Engineer-in-Charge of sample of all materials before placing order and the approved sample shall be carefully preserved on the display board in an appropriate manner at the site office for verification by the Engineer-in-Charge.

For standard bought out items, the sizes manufactured by the firms listed shall prevail when there is discrepancy in the sizes mentioned in the schedule without any financial adjustment.

4.4 SPECIFICATIONS

Unless specifically mentioned otherwise, all applicable codes and standards published by the Bureau of Indian Standard and all other such publication as may be published by them after construction work starts, shall govern in respect of design, workmanship, quality and properties of material and method of testing.

4.5 SAFETY

All equipment shall be complete with approved safety devices wherever a potential hazard to personnel exists and with provision for safe access of personnel to and around equipment for operation and maintenance functions.

Special care shall be taken to ensure against entry of rats, lizards and other creeping reptiles, which may create electrical short circuit inside live equipment.

4.6 DRAWINGS

On completion of all work the contractor shall furnish three copies of Ammonia print along with the original tracing of the following "As built" drawings to the Engineer-in-Charge without any extra cost.

I: Wiring diagram for final power / lighting distribution system showing the rating/ size of switchgear, cables, conduits, lighting fixtures and all accessories for individual installation.

ii Detailed general arrangement drawings of the switchboard complete with dimension in metric units.

iii Drawings showing the route of conduits and cables with sizes, lengths, sources and destination of all cables with the circuit designation number, etc.

iv Drawings showing the balancing of phases with connected load in each circuits, etc.

4.7 TEST CERTIFICATES AND INSTRUCTIONS

Unless specifically mentioned otherwise, the contractor shall furnish, in duplicate, Manufacturer's Test Certificate with the delivery of the equipment to the Engineer-in-Charge and Instruction Manual in English for operations and maintenance of equipment wherever required.

4.8 TESTING AND COMMISSIONING

4.8.1 Before each field test, the contractor shall obtain the permission from the Engineer-in-Charge and all tests shall be conducted in the presence of duly authorised representative. Records of each test shall be prepared immediately after the test and this record shall be signed by contractor's representative conducting the test and the site engineer attending the test. Copies of their record in quadruplicate shall be handed over to the Engineer-in-Charge.

A certificate in quadruplicate shall be furnished by the contractor countersigned by the certified supervisor under whose direct supervision the installation was carried out and the Engineer-in-Charge. This certificate shall be in the prescribed forms in addition to the test certificate required by the Local Electric Supply Authorities

4.9 COMPLETION OF WORK

Each item of the electrical work shall be considered as complete in all respects only after obtaining permanent service connection from local power supply authority, energising, testing and final commissioning of the complete installation as directed by the Engineer-in-Charge.

Payment on each item of electrical work shall be made as per measurement and proportionate to the quantum of work completed. In the event of any dispute with regard to the proportion of work complete, the decision of the Engineer-in-Charge shall be final and binding to the contractor.

4.10 PREAMBLE TO THE SCHEDULE OF WORK

The successful tenderer shall carefully go through the Clauses of Invitation to Tender, Specification, Schedule of Work and drawings and shall include in his rates any sum he may consider necessary to cover the fulfillment of the various clauses contained therein. Unit prices stated in the schedule of work against the item of work shall be inclusive of all installation, accessories and consumables necessary to complete the said work within the contemplation of

the contract. Beyond the unit prices no extra amount will be paid for incidental contingent work and materials.

The quantities mentioned in the schedule of work are probable quantities and it must be clearly understood that the contract is not a lump sum contract, that the probable quantities, the value of the entire tender are only indicative and Employer does not in any way assure the tenderer or guarantee that the actual quantity of work would correspond to the probable quantities in the tender.

No change in unit rate will be admissible on any variation of quantity.

4.11 PARTICULAR TECHNICAL SPECIFICATION FOR WIRING SYSTEM

SCOPE

This specification covers supply of materials, erection and commissioning of distribution wiring, connection to distribution boards, cable laying, earthing and miscellaneous items. Applicable provisions and conditions of contract shall govern the work under the section.

GENERAL

Work to be provided for by the Contractor, unless otherwise specified, shall include but not be limited to the following:

- i: Furnishing of labour, materials, supports, scaffolds, transportation, etc required for the work.
- ii: To provide all incidental items not shown or specified in particular but reasonably be implied or necessary for successful completion of the work in connection with the drawings, specification and schedule of items.
- iii: To provide all supervision for proper execution of the work.
- iv: To conduct and bear all costs in respect of any test advised.

After completion of supply and installation of wiring system and earthing, if any defect in the material or workmanship is found by the Engineer-in-Charge, the contractor shall remove the same and supply better and approved materials at his own cost.

All precaution against theft and fire shall also be taken by the contractor.

MATERIALS

3.1 All materials used in the work shall be ISI approved quality and in its absence conforming to the IS Specification.

WIRING SYSTEM

The electric load of all lights, power outlets, etc. shall be balanced across the three phases.

Generally the final loading of any sub-circuit for lights and fans shall not exceed 800 watts and shall not be connected to more than total 10 fans, lights, socket outlets, etc. Bell push if operated at low voltage shall be fed from a separate circuit of distribution board.

The 16 Amps sub-circuit for power shall be connected to a maximum one 16 Amp. socket outlet or two 6 Amp. socket outlets.

A power circuit shall always be originating from a distribution board or MCB DB and the same shall run in a separate conduit.

The point wiring shall mean wiring from one way of distribution board to point of utilisation of electricity i.e. where the load is applied and this shall include complete wiring from distribution board, supply and fixing of switch board, controlling switches, ceiling rose, batten holder and socket outlet, etc.

Insulated or covered earthing conductors where used, shall have green insulation braiding or covering as appropriate. Under no circumstances shall the colour green be used for other than earthing conductor. In addition where it is required, cables of different colours be used. For identification purposes the following system shall be employed :

Red or any colour (other than black or green)	For phase or switch wire
Black	For Neutral
Green	For earth

Unless otherwise mentioned in the schedule of quantities, single way porcelain/ bakelite terminal connectors with nickel plated brass inserts and screws to suit the conductor size shall be used for intermediate wiring/ joints in junction boxes and in switch boards or by any other method approved by the Consultant/ Engineer-in-Charge.

Distribution wiring in conduit to light, fan, plug points etc. shall be done in looping in system. In this system, no joints or connections shall be made anywhere of the system except at terminating points such as, at terminals of switches, ceiling roses, etc. and in case of socket outlets, at the socket terminals. Intermediate wiring joints of neutral wire in junction boxes will not be permitted.

In the looping back system of wiring on hard wood batten, the wiring shall be done without any junction or connector boxes on the line. All intermediate joints or connections shall be made in the switch board only. Intermediate wiring joints of neutral wire in the junction box will not be permitted.

CONDUIT WIRING

All conduit shall be ISI marked and finished with galvanised or stove enamelled surface. All conduit accessories shall be conforming to IS:2667-1988 and be threaded type. Conduit less than 20mm in diameter shall not be used. All conduits shall be 1.4 to 1.8 mm thickness below 32 mm dia. and 1.6 to 2.2 mm thickness for 32 mm dia. and above.

The conduit for each circuit shall be erected complete with necessary bushes before drawing in of any wire. Galvanised M.S. Spacer of 3 mm thick minimum shall be used between the conduit saddle and fixing surface. The saddle shall be fixed at an interval of not more than 750 mm apart for vertical run and 600 mm apart for horizontal run.

The joint in conduits shall be made by means of threaded couplers and threaded accessories only to ensure electrical continuity throughout. All pipes after cutting, the threading shall be carefully reamed out with special reamer to remove any burr and then painted immediately with an anti-corrosive preservative after removing all traces of oil or grease. Junction boxes shall be provided with gasketed covers to render them dust and damp proof. The conduit accessories having pull outlet for conductors shall only be used in all conduit installation.

Where specified, P.V.C. conduit conforming to IS: 7537 (Part-III) shall be used. The thickness of P.V.C. conduit shall be adequate to withstand mechanical injuries. PVC conduit accessories conforming to IS: 3419-1976 shall be used along with P V C conduit.

The entire conduit system shall be effectively earthed by means of suitable earthing conductors and the resistance from any point to earth shall not be more than one OHM.

After installation of conduit pipes and fittings are completed in all respects, the exposed outer surfaces of the conduit and accessories shall be painted with two coats of approved enamel paints or aluminium paint over a coat of red oxide primer as required to match the surrounding wall finishing. To protect against rust the bare thread portion shall be painted with anti-corrosive preservative.

CONCEALED WIRING

This system of wiring shall comply with all the requirements of surface conduit wiring system specified in Causes 5.1 to 5.6 in addition to the following points:

Making of chase : The chase in the wall shall be filled up neatly made and be of ample dimensions to permit the conduit to be fixed in the manner desired. In case of buildings under construction, chases shall be provided in the wall, ceiling etc. at the time of their construction and shall be filled up neatly after erection of conduit and brought to the original finish of the wall. Specially for ceiling, conduit shall be laid before casting.

Fixing of conduit in chase : The conduit in chase in the wall shall be fixed by means of staples or by means of saddles not more than 60 cm apart. Fixing of standard bends or elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe itself with a long radius which will permit easy drawing of PVC insulated wires. All threaded joints of conduits shall be treated with some approved preservative compound to secure protection against rust.

Inspection boxes : Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires, if necessary. These shall be provided with inspection box covers.

Types of accessories to be used : All outlets, such as switches, wall sockets, etc. may be either flush mounting type or of surface mounting type.

The outlet box shall be mounted flush with the wall. The metal box shall be effectively earthed with conduit by an approved means of earth attachment.

Fish wire : 1 x 18 SWG G.I. wire inside the conduit and accessories to be provided with an extension of 250 mm at both the conduit ends.

Conduit laying in floor/ roof slabs before casting : M.S./ G.I./ rigid PVC/ polythene conduit shall be laid straight as far as practicable and properly placed including binding with the steel reinforcement rods with 22 SWG G.I. binding wire so that proper positions of conduits are maintained.

While laying the conduits for concealed wiring in the ceiling / beams / columns / walls before casting, the contractor shall ensure that both ends of the conduit are plugged by means of dead-end sockets or otherwise to prevent the entry of any foreign material against conduit choking.

All precaution must be taken while laying the conduits in the slabs, R.C. walls, columns, etc. and the contractor shall rectify at his own cost, if any defects are found during process of drawing cables through the concealed pre-laid conduits.

Each M.S. / G.I. conduit shall be provided with protruding length of 150 mm on free end of the conduits with sockets under the bottom level of slab/ beam.

Each rigid PVC/ polythene conduit shall be provided with protruding length of 150 mm on free end of the conduits under the bottom level of slab/ beam.

There shall be no intermediate joints in one straight run of conduit.

All ceiling outlets shall be terminated in a round M.S./ G.I. circular box (80 mm depth minimum)/ deep box to suit standard size ceiling rose or/ and rectangular M.S. junction box or Fan Hook Box as the case may be.

It will be mandatory for the contractor to get the layouts approved by the Engineer-in-charge/Consultant, measurements are checked when the conduits are laid and bound to steel reinforcement rods, before he can release the work for casting of slabs/ floor/ beams etc.

Connector Boxes, Draw-in-Box, Junction Boxes :

These shall be constructed from 16 SWG M.S. sheet and have M.S. cover. Minimum size for connector box is 150mm x 100mm and for Draw-in-Box is 100mm x 100mm with required depth upto 80mm.

Fan Hook Box : These shall be 100mm dia x 80mm depth, constructed from 14 SWG M.S. sheet and provided with one 12 mm dia. M.S. rod of 300mm long having 'U' bend inside the box.

Painting : Both inside & outside wall of switch board, connection box, draw-in-box and other M.S. accessories shall be painted with two coats of anti-corrosive paint in addition to other painting instructions given elsewhere.

WIRES

Unless otherwise mentioned in the schedule of quantities, only single core PVC insulated / PVC insulated & sheathed cable consisting of multistrand / flexible copper conductor and of approved manufacturers conforming to relevant I.S. shall be used for wiring in conduit system.

The maximum number of wires drawn in one conduit shall not be greater than the recommended number given in the Table – 1 given in this section.

INSTALLATION AND WIRING OF DISTRIBUTION BOARD/ MCB DISTRIBUTION BOARD.

Where fixing of distribution board/ MCB DB on double teak wood board is specified only hinged type wooden board with brass hinge shall be provided and the size of the board shall be such as to match the size of the Distribution board/ MCB DB. A minimum margin of 25 mm shall be provided on all sides of the distribution board/ MCB DB. The outgoing circuit shall be taken out through a horizontal slot at the rear side of the distribution board/ MCB DB enclosure.

Where fixing of Distribution board/ MCB DB on M.S. frame is specified, the frame shall have sufficient mechanical strength to carry the weight of the DB./ MCB DB.

Where fixing of Distribution board/ MCB DB will be of concealed type, the chase in the wall shall be neatly made and be of ample dimensions to permit the DB to be recessed in wall and flushed with finished wall surface.

The cable / wires shall be connected to the terminal only by soldered or crimped lugs, unless the terminal is of such a form that it is possible to securely clamp them without cutting away of cable strands.

All bare conductors shall be rigidly fixed in such a manner that a clearance of at least 25 mm is maintained between conductors and material other than insulating material.

4.12 CABLES

TYPE AND QUALITY OF CABLES

Unless otherwise specified in the Schedule of Quantities all wiring cables shall be P V C insulated and P V C sheathed conforming to relevant IS Standard. The conductor of cable shall be of stranded wires of aluminium or copper as specified. All power cables shall be 1100 volts grade, PVC insulated, PVC sheathed and armoured with stranded aluminium conductor. Materials should be obtained from the approved list of manufacturers/ brands as indicated in the document.

HANDLING OF CABLES

It shall be ensured that both ends of the cables are properly sealed to prevent ingress / absorption of moisture by the insulation.

When the cable drums have to be moved over short distances, they should be rolled in the direction of the arrow marked on the drum. While removing cables, the drum shall be properly mounted on jacks or on a cable wheel or any other suitable device, making sure that the spindle, jack, etc. are strong enough to take the weight of the drum.

DEFECTIVE CABLES

Cables with kinks and straightened kinks or with similar apparent defects like defective armouring, etc. shall not be installed.

BENDING RADIUS

Cable runs shall be uniformly spaced, properly supported and protected in an approved manner. All bends in runs shall be well defined and made with due consideration to avoid sharp bending and kinking of the cable. The minimum safe bending radius for all types of P V C cables shall be taken as 12 times the overall diameter of the cable. Wherever practicable, larger radius shall be adopted.

LENGTH OF CABLES

All cables shall be laid in one length. No joint shall normally be made at any intermediate point in through runs of cables, unless the length of the run is more than the length of the standard drum supplied by the cable manufacturer. In such cases where jointing is unavoidable, the same shall be made by means of standard cable joint boxes/ kits. Before cutting the cables, the requisite length between terminals (including extra length required at loops) shall be carefully measured.

STRIPPING OF OUTER COVERING

While cutting and stripping the outer covering (i.e. sheathing of the cable, care shall be taken that the sharp edge of the cutting instrument does not cut or damage the inner insulation of the conductor. The protective outer covering of the cable shall be stripped off near the connecting terminal, the protective covering being maintained upto a point as close as possible to the connecting terminal.

CABLE LAID IN TRENCHES

Cables shall be laid generally in accordance with Indian Standard Code of Practice IS: 1255.

SIZE OF TRENCH

Unless otherwise mentioned in the Schedule of Quantities, the minimum width and average depth of trench for laying a single cable in ground shall be 460mm

and 760mm for L.T. and 1000 mm for H.T. cable respectively. For laying of multiple 11 KV and 6.6 KV grade power cables, horizontal axial spacing shall be 250mm. For 1100 volt grade power cables, the horizontal axial spacing shall be 150mm. However, communication cable shall not be taken in a common trench. Where more than one cable are to be laid in the same trench in horizontal formation, the width of trench shall be increased according to the above stated inter-axial spacing between the cable, (except where otherwise specified). There shall be a clearance of at least 150 mm between the trench edge and axis of the end cable.

EXCAVATION OF TRENCH AND PREPARATION OF BED

The trench shall be excavated in reasonably straight line. Where there is a change in direction, suitable curvature shall be provided. Where gradients and changes in depth are unavoidable, these shall be gradual.

Adequate precautions shall be taken during excavation not to damage any existing cables, pipes or similar installations in the proposed route. Where bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Engineer-in-Charge.

The bottom of the trench shall be level across the width and free from stone, brick bats, etc. The trench shall be then provided with a cushion of fine sand, the thickness of the cushion being not less than 75mm.

LAYING OF CABLES

All cables shall be tested for proper insulation prior to laying. The cable drums shall be transported on wheels to the place of work. The cables shall be laid out in proper direction as indicated on the drum using cable drum lifting jacks. In case of higher size cables, the laid out cables shall run over rollers placed at close intervals and finally transferred carefully on to the trenches and racks, care shall be taken so that kinks and twists or any mechanical damage does not occur in cables. Only approved cable pulling grips or other devices shall be used. The entire length of cable shall, as far as possible, be paid in one operation. However, if this is not possible, the remainder of the cable may be shifted from position by 'falking' i.e. by making one long loop in the reverse direction. For crossing water, gas or sewerage pipes, etc, cables shall be taken above the pipes where minimum 500 mm clearance is not available. The cable shall cross these pipes through RC/ GI pipes at a minimum depth of 750 mm from finished ground level keeping the distance between the utility pipes and pipe carrying cables 300 mm minimum.

While laying cables parallel to building, railway track, utility pipe lines, drainage, sewerage, etc. the minimum clearance shall not be less than 1000mm.

Adequate length of cables shall be pulled inside the switch boards, control panel terminal boxes, feeder pillar etc. so as to permit neat termination of each core.

SURPLUS CABLE

At the time of original inspection, approximately 1 meter of surplus cable (in the form of a loop or otherwise) shall be left at each entry or exit of the cable at a pole or at the pillar box, or near any terminal as may be directed by the Consultant / Engineer-in-Charge.

PROTECTIVE COVER FOR CABLES DIRECTLY BURIED IN GROUND

Except where otherwise directed by the Consultant/Engineer-in-Charge, the cable (for the entire length in trench) shall be protected by a layer of bricks laid flat on top and shall be provided at least by 75 mm sand cushioning both at top and bottom. This brick protection shall cover all the cables in the trench (single cable or multiple cables, in horizontal formation). In case of a single cable, the brick protection shall consist of one brick flat (with the length along the width of the trench) and supported on two lines of brick-on-edge, one on each side of the cable (with the length of the bricks along the length of the trench).

For multiple cables in horizontal formation, in addition to the two outer lines of brick-on-edge, there shall be additional lines in between adjacent cables. The top cover of brick flat shall extend to cover all the cables, each brick being supported on the lines of brick-on-edge.

BACK FILLING OF TRENCH

After laying of cables the remaining portion of the trench shall be back filled with good excavated soil and well rammed in successive layers not exceeding 300 mm depth each and duly compacted to the satisfaction of the Consultant/ Engineer-in-Charge. Surplus soils of excavation shall be removed or disposed of as per direction of the Engineer-in-Charge.

All material like sand, brick and clamp, etc. shall be supplied by the contractor. The cable laying rate shall be inclusive of all these items.

CABLES LAID THROUGH PIPE SLEEVES

Entry of cable from underground trenches to the building or tunnel shall be through pipe sleeves. Necessary precaution shall be taken to make entry point fully water tight by properly sealing the pipe sleeves in a manner approved by the Engineer-in-Charge.

Where cables are required to cross roads, railway tracks and surface drains, they shall be taken through pipe sleeves at a minimum depth of 1000 mm.

LAYING OF CABLES ON RACK/ TRAY/ BRACKET/ HOOKS/ MASONRY TRENCH

Where cables are required to be laid directly along structure walkway, walls, ceiling, they shall generally be taken exposed on brackets, cable racks, trays, hooks laid along building structure. Spacing of saddles/ hooks shall be such that the cables are straight and shall not exceed 750 mm.

The cable rack/ trays shall be ladder type / pre-fabricated perforated type and bends / curvature shall be smooth and suitable for bending the largest cable running in the rack / tray. The cable rack/ trays shall be suitably installed on the building structure with proper support at regular intervals.

Cable rack/ trays shall be so arranged that they do not obstruct or impair clearance of passage way.

Where there is possibility of mechanical damage cable racks / trays shall be adequately protected by sheet steel cover.

Unless otherwise specified in the schedule of quantities the rack/ trays shall be painted with corrosion resistant paint and finished with enamel paint of shade battleship grey or any other colour shade acceptable to Consultant/ Engineer-in-Charge.

CABLE ROUTE MARKER

Cable route markers shall be provided at each joint, entry to buildings, each turn, either side of the road crossings and at 30 meter intervals for straight cable runs and at location directed by the Engineer-in-Charge.

The cable marker shall be of cement concrete slab of R.C.C.type (1:2:4) and of size 600mm x 300mm at the bottom and 500 mm x 200 mm at the top with a thickness of 100 mm with marking 'CABLE' and shall be laid flat at finished ground level centered over the cables for easy identification.

Unless otherwise specified in the schedule of quantities, galvanised Iron type cable route marker of size 100mm dia 50 mm thick G.I. Plate with marking 'CABLE' thereon welded to 35 mm x 35mm x 6mm angle iron 600mm long fixed in a rigid manner may also be used as approved by the Engineer-in-Charge.

All materials like cable route marker, sand and cement, etc. for fixing the same to be supplied by the contractor. The cable laying rate shall be inclusive of all these items.

CABLES TERMINATION

Power cable termination shall be carried out in such a manner as to avoid strain on the terminals by providing suitable clamp near the terminals. All power cables shall be terminated to the circuit breaker, switch fuse units, busbars, etc. by means of suitable sizes crimping type or soldering type cable socket / lugs / ferrules and empire tape upto palm of the cable lug. PVC tape shall not be used directly, because of its poor thermal stability. It may however, be used over the empire tape. Control cables shall be terminated by crimping or directly clamped in the terminal blocks by screws.

When pinching the smaller size conductor directly in the terminal bore of the switches, the individual strands shall be fanned out and cleaned by wire wool or emery paper and the cleaned surface shall be coated with a thin layer of oxide inhibiting grease. The conductor shall be tightened fully to the terminal bore but over tightening shall be avoided.

For connection to busbars and other terminals, brass or cadmium plated nuts/ bolts and washers shall be used. Copper cables shall never be terminated directly on aluminium busbar. Suitable measure shall be taken to avoid heating due to bimetallic contacts.

A selection chart of crimping type cable lugs for various combination of cables/ busbar/ fuse switch terminals is shown below :

Material of busbar/ switch terminals	Material of Cables	Material of crimping lug
: Aluminium	: Aluminium	Aluminium over tin plated copper
: Copper	Aluminium	Aluminium lug with copper plated palm
: Silver/tin plated copper	Aluminium	Aluminium or tin plated copper
Aluminium	Copper	Tin plated copper
Copper	Copper	Copper or tin plated copper

4.13 EARTHING

All non current carrying metallic part of various electrical equipments as well as cable armouring, metallic conduit, cable racks/ trays, brackets, supporting structures, etc. shall be effectively earthed by not less than two separate and distinct earth connection in accordance with Indian Electricity Rules, and the relevant Indian Code of Practice for earthing 3043-1987.

EARTH ELECTRODE

PIPE ELECTRODE

The earth electrode for earthing station shall comprise G.I. pipe 'B' Class of 50mm internal diameter and 3 Mtr long in one single piece with holes 12mm dia on all sides at 150 mm centre, upto a minimum height of 2.5 metre from bottom. Removable caps / wire mesh funnel shall be provided at the top of pipe to facilitate pouring of water. Suitable clamps made of 40mm x 6mm galvanised M.S. flats complete with bolt and nut shall be provided with the electrodes at 100 mm from the top end for connecting earth conductor. No joints will be allowed in the earth electrode. The electrode shall be driven at least 2 metre clear from masonry structure and the distance between two electrode shall be not less than 2 metre when installed in parallel and preferably placed twice the length of the electrode i.e. 6 metre. A masonry inspection pit of inside dimension 300mm x 300mm x 300mm deep (unless otherwise stated) shall be built with 125 mm thick cement mortar (6:1) brick work both inside and outside plastered with 20mm thick and neatly cemented 1.5 mm thick, inside top and outside around the top of the earth pit, so that the top of the G.I. pipe is 250 mm below the finished ground level and the opening on top shall be provided with C.I. manhole ring having lockable C.I. cover fixed & flush with the outside finished ground level.

PLATE ELECTRODE

Where plate electrode for earthing is to be employed, the size of the plate shall not be less than 600 mm x 600 mm x 6.3 mm for G.I. plate in thickness and 600 mm x 600 mm x 3.15 mm thickness in case of copper plate.

The plate shall have a drilled hole 14 mm dia. at the centre. The G.I. flat of not less than 40 mm x 6 mm (1 no. 25 mm x 6 mm G.I. flat for lightning conductor installation) should be connected to the plate by means of a 65 mm long 12 mm dia galv. bolt, double nuts using double galv. washers. In case of copper plate, copper flat of not less than 25 mm x 6.0 mm shall be used as the earth lead. The flat shall first be fastened on one side of the plate, leaving adequate length of flat, which shall be taken over to the other side i.e. to the earth busbar, switchboard, pole, continuous earth wire for O.H. line, service bracket, lightning arrestor or the object to be earthed and be fastened as per the details of IS:3043-1987. No joint on the earth lead conductor is permitted. Every care shall be taken to ensure that the ends of the wire/ flats have been securely clamped by the bolt on cleaned surface of the plate and establish a good electrical contact.

The plate shall be buried vertically at a minimum of 3.6 M below the ground level for sandy soil and 2.0 m below the ground level for normal soil. In order to place the same at the prescribed depth, the dimension of pit to be excavated shall be 900 mm x 900 mm x 4 m deep. The G.I. plate shall be placed in position by the contractor only after the inspection of excavated pit and approval is obtained from the Consultant/ Employer.

After placing the plate the earth lead conductor shall be protected by means of a continuous length of G.I. pipe (Class B) having 50 mm dia (minimum) bore or route depending upon the size of the lead, right from the plate upto a height of 600 mm metre (2 ft.) above ground level. The whole length of pipe shall be filled with bituminous compound of approved make and brand. The molten compound shall be poured from the top end of the pipe and topped upto overflowing.

A masonry inspection pit for the earth station of inside dimension approximately 300 mm x 300 mm x 300 mm depth (unless otherwise stated) shall be built with 125 mm thick cement mortar (6:1) brick work with 1st class bricks, both inside and outside plastered with 20 mm thick and neatly cemented 1.5 mm thick, inside, top and outside around the top of the earth pit. The opening on top shall be provided with C.I. manhole ring having lockable C.I. cover fixed and flush with the outside finished ground level.

Electrodes shall be buried at least 2 meter away from masonry structure/ building/ pole or object to be earthed. However, earthing electrodes for L.C. installations should be as close to the down conductors as possible. Electrodes when installed in parallel, shall not be placed less than 2 meter apart and preferably placed at distance greater than 6 meters.

All the excavations shall be duly back filled, dressed and rammed.

4.14 EARTH BUSBAR

GALVANISED M.S. FLAT

Unless otherwise specified in the schedule of quantities, the earth bus bars shall be of heavily galvanised M.S. Flat of cross section 50mm x 6mm having

adequate number of drilled holes with 10mm galvanised steel bolts, nuts, plain and spring washers for securely connected the earth leads and the continuity of conductor. The bulbar shall be fixed on wall, having clearance of 6mm from wall with spacing insulators with 13mm dia G.I. rag bolts, spaced about 50mm apart.

COPPER FLAT

To be used, as specified in the schedule of items, where earthing requirements are more stringent, with use of brass bolts, nuts, washers for connections.

4.15 EARTH LEAD CONDUCTOR

The earth lead for each electrode shall be 7/10 S W G stranded G.I. wire connected securely to the earth electrode and earth bulbar. The earth lead shall be mechanically protected with a continuous length of 25mm dia G.I. Pipe (Class 'B') right from the electrode to the earth bulbar and the pipe shall be filled with bituminous compound.

Galvanised M.S. Flat earth conductor directly buried in ground shall generally be taken at a depth of 600 mm and shall be provided with one coat of bituminized paint, one layer of half lapped bituminized tape and a final coat of bituminized paint to prevent corrosion.

The earth conductor when laid inside building/ sub-station shall be taken either exposed on cable racks/ trays, walls, ceiling, etc. or embedded in concrete depending on installation. Galvanised M.S. saddles clamped to M. S. flat spacers with tapped holes shall be used for clamping earth conductor. Flats shall be supported at intervals not exceeding 500 mm and stranded wires at intervals of 300mm.

Connection of earthing leads to earth electrodes and termination of flat earth continuity conductor to equipment shall be made by means of bolting. Connection of stranded earth wire to earth bus as well as to equipment shall be made through crimping type lugs and bolting. Jointing and tapping of flat earth conductor shall be done by means of welding.

The earth resistance from any point of the earthing system shall not be more than one ohm.

WORKMANSHIP AND INSTALLATION WORK

The workmanship shall be of good commercial quality and all supply material and installation work shall be completed to the full satisfaction of the Engineer-in-Charge.

4.16 PARTICULAR TECHNICAL SPECIFICATIONS FOR LIGHTNING PROTECTION SYSTEM

SCOPE

This specification covers supply of materials, fabrication and erection of Lightning protection system comprising air terminations, horizontal conductors,

down conductors and earth electrodes. Applicable provisions and conditions of contract shall govern the work under the section.

GENERAL

Work to be provided for by the Contractor, unless otherwise specified, shall include but not be limited to the following :

- i: Furnishing of labour, materials, supports, scaffolds transportation, etc required for the work.
- ii: To provide all incidental items not shown or specified in particular but reasonably be implied or necessary for successful completion of the work in connection with drawings, specifications and schedule of items.
- iii: To provide all supervision for proper execution of the work

After completion of supplying and installation of lightning protection system, if any defect in the material or workmanship is found by the Engineer-in-Charge the contractor shall remove the same and supply better and approved materials at his own cost to the satisfaction of the Engineer- in-Charge.

All precaution against theft and fire shall also be taken by the contractor.

MATERIAL

All material used for lightning conductors, down conductors, earth termination network, etc. of the protection system shall be reliably resistant to corrosion or be adequately protected against corrosion and generally conforming to IS:2309.

The entire lightning protection system shall be mechanically strong to withstand the mechanical forces produced in case of a lightning stroke.

HORIZONTAL AIR TERMINATION CONDUCTOR

Unless otherwise specified air termination shall be horizontal conductor. The horizontal air termination shall be so inter-connected that no part of the roof is more than 9 meters away from the nearest horizontal conductor. For flat roof horizontal conductor shall generally be provided along the outer periphery of the roof. The conductor shall be exposed to atmosphere.

All metallic protections, vent pipes, railways etc. on or above the main surface of the roof shall be properly bonded to the air termination network.

DOWN CONDUCTOR

Down conductors shall follow the most direct path possible connecting the horizontal air termination conductor and the earth termination i.e. the ground electrode avoiding sharp bends, up-turns and kinks. Joints shall as far as possible be avoided in down conductors.

JOINTS

The joints in the lightning protection system shall be avoided as far as possible. There shall be no joints in the down conductor below ground level.

Where joints are necessary they shall be mechanically and electrically effective and shall be so made as to exclude moisture completely.

The joints may be soldered, riveted or bolted and mentioned in the schedule of work. With over-lapping joints the length of the overlap shall not be less than 50 mm for all types of conductor. Contact surface shall first be cleaned and then inhibited from oxidation with a suitable non-corrosive compound. Strips shall be tinned, soldered, welded or brazed and at least double riveted. Bolted joints shall not be used on test points or on bonds to existing metal. For rust protection the welded joints shall be treated with barium chromate. Welded surface shall then be painted with red lead and aluminium paint.

TESTING POINTS

Each down conductor shall be provided with a testing point in a position convenient for testing but inaccessible for interference. No connection, other than one direct to an earth electrode shall be made below a testing point.

EARTH TERMINATIONS

Each down conductor shall have an independent earth termination and arrangement of isolation for testing purposes. The earth termination shall be located as close as practicable to the down conductor. Inter connections with other termination of the conductor system and with other buried metal services and earth terminations shall be made with G.I. tape laid directly at an average depth of 700 mm below finished ground level for the purpose of equalising the potential distribution in the ground.

EARTH ELECTRODE

Earth electrode shall be constructed and installed as specified in Part-B. The pipe/ plate electrode shall be driven into the ground as close as practicable but outside the circumference of the structure.

FIXING OF CONDUCTOR

Unless otherwise mentioned in the Schedule of Quantities the wall shall be drilled and plugged with teak wood pins of not less than 50mm long by 25mm square inner and 19 mm square outer surface. The void shall be finished according to the nature of wall surface with cement plaster.

Conductors shall then be securely attached to the building to be protected by galvanised steel fasteners of 2mm thick which shall be substantial in construction and wood screws and approved by the Engineer-in- Charge.

EARTH RESISTANCE

Properly made earth connections are essential for effective functioning of a lightning protection system and every effort shall be made to provide ample contact with the earth so that the earth resistance can be kept as low as possible.

The whole of the lightning protection system shall have a combined resistance to earth not exceeding 1 ohm.

WORKMANSHIP AND INSTALLATION WORK

The workmanship shall be first class and all supply material and installation work shall be completed to the full satisfaction of the Engineer-in-Charge.

CONTRACTORS RATE TO INCLUDE

Apart from other factors mentioned elsewhere in this contract, the rates for the above shall include for the following :

- i: All labour, materials, tools and construction equipment required for proper execution of job
- ii: Scaffolding including erection and removal
- iii: Making good of all damaged civil work, if any

4.17 PARTICULAR TECHNICAL SPECIFICATION FOR ELECTRICAL EQUIPMENT

SCOPE

This specification covers supply of materials, fabrication, erection, testing and commissioning of switch boards, Distribution boards, Meter board, Lighting equipment, Switches, socket outlets and miscellaneous items. Applicable provisions and conditions of contract shall govern the work under the section.

GENERAL

The contractor shall have to submit manufacturer's Test Certificate for switchboards, switch fuse units, meters, fuse fittings, circuit breaker, isolating switches and other items as directed by the Engineer-in-Charge.

After completion of such supply and installation work of the electrical equipment, if any defect in the material or workmanship is found by the Engineer-in-Charge, the contractor shall remove the same and supply better and approved materials at his own cost.

All precaution against theft and fire shall also be taken by the contractor.

The contractor shall provide complete supervisions for proper execution of the work.

MATERIALS

All materials used in the work shall be of ISI marked wherever available, and of approved make and quality and in its absence conforming to the I.S. Specification.

For fabricated equipment, special care shall be taken to make the enclosed equipment proof against entry of creeping reptile, which may create electrical short circuits inside the live equipment.

L.T. MAIN DISTRIBUTION SWITCH BOARD /DIST. SWITCH BOARD

The 415 Volt main distribution switch board shall have incoming unit fed from L.V. side of transformer/ main distribution board.

STANDARDS

The equipment shall be designed to confirm to the requirements of I.S: 4237, I.S: 2147 and I.S: 375.

CONSTRUCTION

The main L.T. P.C.C board shall be of totally enclosed, topicalised, vermin proof, free standing, cubical type dead front minimum 2.0 mm thick sheet steel construction work housing incoming ACB/ MCCB/ SDFU, requisite number of outgoing ACB, MCCB, fuse switch or switch fuse units, busbars, Switch board shall be readily extensible on both sides. The L.T. terminal of the transformer shall be connected to the incoming terminal of the MCCB/Air Circuit Breaker through adequate number and size of aluminium conductor 1.1 KV grade PVCA cable.

The incoming and outgoing functional units shall be arranged in multitier formation, to provide a compact switch board having a pleasant appearance. Each unit shall be accommodated in a separate compartment having gasketed hinged door which shall be interlocked with the operating mechanism so as to prevent opening of the door when the switch is in the 'ON' position and also to prevent closing of the switch with the door not properly secured.

The 'ON' and 'OFF' positions of the switch handle shall be distinctly indicated by proper marking. Modular construction shall be adopted to cater for different units with each cubicle having a busbar chamber and cable compartment. The maximum height of the devices on the panel shall not exceed 2000mm.

Suitably engraved identification levels shall be provided on each unit.

When switch board of floor or wall mounting type is specified instead of cubicle type with incoming and outgoing Fuse switch units or switch fuse units, the board shall comprise a suitable length of Busbar chamber. The board shall have provision for future extension. The floor stands or wall bracket shall have sufficient mechanical strength to carry the weight of the entire switch board.

The height shall be such that maximum operating height of the top unit shall not exceed 1800 mm.

BUSBAR

The main horizontal busbar shall be air insulated and made of high conductivity, high strength aluminium alloy or electrolyte copper complying with the requirements of grade E 91 E of IS 5082. The current density in each busbar shall not exceed 160 Amp. per sq. cm. for copper of 125 amp. per sq. cm. for aluminium.

The main phase busbar shall have continuous current rating throughout the length of power control centre and the neutral busbar shall have a continuous rating of at least 50% of the phase busbar.

Large clearance and creepage distance shall be provided on the busbar system to minimise the possibility of a fault.

The busbar and vertical risers horizontal connectors shall be fully insulated with PVC sleeve or tape to prevent accidental touch.

The busbar including neutral and earth bar shall be short circuit tested for fault withstand of 60 KA RMS for one second as per IS:8623 for factory Built Assemblies.

In no case, the rating of busbars shall be less than the Incoming Circuit Breaker or switch.

Busbar should be supplied with insulating material such as Permalin, Hylam, and support shall be sufficient close and robust and support should permit - sufficient movement for compensation of comparative stress in the event of short circuit.

AIR CIRCUIT BREAKER

The circuit breaker would be constructed in modular construction or would be enclosed in cassettes, designed for easy Switch Board Construction. The formed and welded steel construction should be given corrosive resistance treatment following fabrication work.

The breaker would have three distinct position, service/ test/ isolated within the cubicle, achieved by a racking cam and slide rails, simplifying inspection and from this position breaker should be able to withdrawn from housing. With door closed, the breaker should be withdrawn to test and isolated position.

The contact system should be designed to ruggedly and to effectively utilize the magnetic force generating in the current path ensuing high short time withstand current and interrupting capacity and reducing the let through energy. The ACB should be provided with separate set of arcing contacts and main contacts ensuring high mechanical and electrical life. Arc chutes on arcing contacts with de-ionisation plate should be provided. The contact tips should be made of Silver Nickel Alloy and arcing contact tips are of Silver Tungsten Alloy.

ACB should be suitable for manual or Motor wound stored charge spring closing mechanism. ACB should be provided with static trip release, inherent safety interlocks, such as safety shutters and door interlock, "OFF" & "ON" indicator auxiliary switches and contacts. ACB should be complete with overload protection, short circuit protection, under voltage trip, auxiliary contacts and instruments as specified in the schedule.

The ACB should comply with Indian Standard Specification I.S. 2516-1977 and IEC 157 and should be certified by CPRI.

MOULDED CASE CIRCUIT BREAKER

The MCCB should comprise of a switching mechanism, contact system, arc extinguishing device and the tripping unit, contained in a compact moulded case and cover.

The insulating case and cover shall be made of high strength, heat resistant, flame retardant thermo setting material, providing interphase insulation of a very high dielectric strength and an insulated enclosure with high withstand capability against thermal and mechanical stresses with protection against any fire hazards.

The trip free toggle mechanism should ensure that the trip command overrides all other commands.

MCCB should employ a maintenance free contact system designed to minimize the let through energies while handling abnormal currents. The special sintered contact tip should provide a wiping action, high resistance to erosion during interruption and a stable contact for normal service current.

A series of grid plates should be mounted in parallel between supports of insulating material. The profile of the de-ion steel plates extends directly over the contacts and draws the arc from the moving contact up into the divider chamber, thus confining, dividing and extinguishing the Arc.

The handle position should give positive indication of whether the MCCB is 'ON' (top), 'OFF' (bottom) or 'TRIPPED' (midway).

The tripping element provided on each pole of the MCCB should operate on a common trip bar because of which it does not create single phasing in the event of a fault on any of the phases.

The base design ambient temperature of the MCCB should be 40 degree C.

When specified the MCCB should be fitted with under voltage protection, earth fault protection, alarm & auxiliary switch etc.

FUSE SWITCH UNIT

The fuse switch units shall be of double break type suitable for load break duty, with quick make and break mechanism and front drive mechanism, generally conforming to IS:4064 -1978 having fully shrouded contacts. All switch contacts shall be self aligning, spring loaded, silver plated. The isolators shall be connected on the busbar side or incoming side and fuses on the load side. However, fully withdraw able carriage to facilitate quick fuse link replacement is preferred.

The individual fuse switch units shall be either triple pole and neutral or single pole and neutral as specified with a front operating handle. The fuse links shall be non-deteriorating HRC type complying with IS:2208-1962.

The units which are to be installed separately should be totally enclosed fully shrouded sheet steel clad/cast steel casing.

INSTRUMENTS

The measuring instruments shall comply with IS:1248 in all respects.

Moving iron, square, flush mounting type instruments shall be used for measuring A.C. Voltage and currents.

The instruments shall normally be mounted on the hinged door of an all welded fabricated sheet steel housing of rigid construction to allow easy access to small wirings. Circuits shall be protected by H R C type fuse links complying with IS: 9224 (Part-II) -1979. The fuses shall be mounted near the tap-off point from the main connections so that a fault in the instrument wiring does not affect the main supply. Small wiring shall be of 660 Volt grade single core flame retardant low smoke PVC insulated cable with copper conductor having minimum size 2.5 sq. mm. These shall be coloured coded for identification of circuits. The instruments shall be of approved make & acceptable to the Consultant/ Engineer-in-Charge.

CABLE TERMINATIONS

Separate cable compartment with doors having bolted cover plates shall be provided to facilitate cable termination to individual units. The design shall ensure generous availability of space for easy installation and maintenance of cabling and adequate safety for working in one vertical section without coming into accidental contact with live parts in an adjacent section. The compartments shall have detachable cover plate with gaskets at the bottom of the cable compartment unless specified otherwise. Cable glands and lugs of suitable sizes shall be provided for cable termination. Suitable arrangements shall be provided in the compartment for clamping of the cables.

EARTHING

G.I./copper flats shall run the entire length of the switch board. Two bolted type earthing terminals shall be provided in the board for connecting to the earth grid.

METAL TREATMENT

All steel materials used in the construction of the switch board shall undergo a rigorous rust proofing process comprising alkaline digressing, descaling in dilute sulphuric acid, cold rinsing, recognised phosphating process. Passivating and drying with compressed air in dust free atmosphere. It shall then receive two coats of highly corrosion resistant enamel paint of approved shade.

4.18 DISTRIBUTION BOARD

The distribution board shall comply with IS: 2675-1983 and B.S. 214 in all respects.

The distribution board shall be housed in a dust and vermin proof metallic enclosure fabricated from 2mm thick all welded sheet steel suitable for wall / column mounting and complete with a door of rigid construction fitted with dust protecting gasket, and robust fasteners. The enclosure shall have suitable provision for fixing of switch fuse units, fuse fittings and neutral bar on high grade rigid insulating support. The fuse fittings shall be connected by a tinned copper busbar. Each fuse bank shall be provided with a cable socket for the incoming cable. The socket shall be situated centrally and must be covered by an insulating shroud for safety. Phase separation barriers made out of arc resistant materials shall be provided between the fuse banks. All bare current carrying parts shall be protected with a bakelite sheet of 3.5 mm thick to prevent accidental contact.

The distribution board of single phase and neutral type shall be fitted with an earth bar for termination of each continuity conductor of outgoing circuits.

In case of concealed system, the boxes are to be flushed with the wall and the cover shall be made from 5 mm thick opal acrylic sheet or 3 mm thick decorative white top bakelite Electrical switch board cover of Hylam make.

The sheet steel parts shall undergo a rigorous rust proofing process comprising alkaline degreasing, descaling in dilute sulphuric acid, cold rinsing and a recognised phosphating process. The steel work shall then receive two coats of high corrosion resistant primer paint before final painting by application of synthetic enamel paint.

MINIATURE CIRCUIT BREAKER DISTRIBUTION BOARDS (MCBDB)

SPN MCB DISTRIBUTION BOARDS (SPN MCBDB)

The SPN MCB Distribution Board (SPN MCBDB) shall be housed in rust protected sheet steel enclosure shall be designed to provide protection against ingress to IP42 of IS-2147. This shall also be provided with the add - on acrylic door/ double door (Metallic) when specified. The MCB DB shall be supplied complete with tinned copper busbar of adequate rating and incorporating Isolator; MCB or equivalent RCCB as incomer. MCB's shall be mounted onto specially designed din channel. The special mounting channel shall permit easy removal - even of - MCB in the middle of the bank without disturbing other MCBs.

The incomer phase shall accept 35 sq.mm cable while the neutral shall accept 16 sq.mm cables. The consumer unit shall have provision of 20 mm/ 25 mm knockouts at top and bottom and two 32mm/ 25 mm knockout on sides facilitates wiring space making for flexibility and convenience of wiring.

TPN MCB DISTRIBUTION BOARD (TPN MCBDB)

The TPN MCB Distribution Board (TPN MCBDB) shall be fabricated from CRCA sheet. This shall be painted in aesthetically appealing two-tone powder coated finish. The TPN DB shall have provision for incorporating isolator, MCB or RCCB as incomer. The busbar shall be integral type single piece busbar (Cu) and coupling links. The MCBs shall be arranged in two vertical banks with switch lever operating in horizontal plane for on-off switching. Specially designed mounting channel for quick shop fitting and easy removal shall be fitted.

The sheet steel enclosure fitted with add-on acrylic door/ double metallic door shall be provided with protection against ingress IP42 or IS:2147. The incomer phase shall accept upto 35 sq.mm cable while the neutral shall accept 16 sq.mm cables.

Two conduit entry plates at top and bottom shall be provided to facilitate drilling conduit holes at site to suit site requirements. The TPN DB shall conform to IS: 8623 for factory built assembly

METER BOARD

Unless otherwise mentioned in the schedule of quantities the Meter Board shall house a kwh meter in a dust and vermin proof metallic enclosure fabricated from 2 mm thick all welded sheet steel suitable for wall mounting. The door shall be secured by fasteners, enabling dust protecting gasket to be compressed easily. The kWh meter shall be of approved make and the same shall be mounted on a rigid insulating support. There must be a viewing aperture on the M.S. door covered with a 2mm thick clear acrylic sheet for easy meter reading and it shall be possible to seal the enclosure against unauthorised opening.

The sheet steel enclosure shall undergo rust proofing process and painting as specified in Part-B.

FUSE CUT OUTS

The fuse cut outs shall be totally enclosed, metal clad suitably for mounting on flat vertical surface and shall be provided with a screwed top cover. It shall be possible to seal the enclosure against unauthorised opening.

PUSH BUTTONS AND CONTROL SWITCHES

All push button switches shall be of sturdy design suitable for all types of control circuit. Unit construction shall be adopted so as to have any desired arrangement of contact.

Control and selector switches shall be of sturdy design with modular construction comprising rotary type switch with pistol grip or twist type operating handle and a number of switching elements operated by a single shaft and shall have suitable position indicator to show that the switch is in selected position.

The push button and control switch shall be of approved make.

CONTACTOR UNITS

The contactor unit shall comply with IS:2959 in all respects.

The main contactor unit shall be of robust in design having double break bounce free type contacts and pressure type terminal clamps. The contacts shall be made of antiweld silver cadmium oxide. The coil shall be vacuum impregnated, backed with inter-layer paper insulation and finally moulded in hard resin.

The contactor units shall be of approved make.

4.19 LIGHTING EQUIPMENT

The luminaires for fluorescent lamps shall be shop assembled, fully wired and suitable for 1 No. 4 ft. tube or 2 Nos. 4 ft. tubes as the case may be. The salient features of these luminaires are basic channels/ rails, 240 volt ballasts with copper winding wire, spring loaded bipin type lamp holders, glow type starters and condensers. Reflectors and/ or decorative covers shall be supplied as specified in the Schedule of Quantities.

The luminaires for incandescent lamps shall be as specified in the schedule of quantities and approved by the Engineer-in-Charge before the same is used.

The incandescent Bulkhead type fittings shall be of cast aluminium alloy body, finished by application of synthetic enamelled silver grey paint outside, white insides, with front glass, wire guard, tropicalised gasket, B. C. Lamp holder and suitable for use with 100 Watt G.L.S. Lamp. The fittings shall have tapped 19mm E.T. for conduit entry.

The Highbay luminaires for sodium/ mercury vapour/ metal halide lamps shall be integral type unit having a spun aluminium canister at the top for housing control gear, terminal block for the incoming supply, earthing terminal and suspension arrangement. The luminaire shall have reflectors of spun anodized aluminium with a secular finish and suitable for use with 150/ 250 / 400 watt HPSV / HPMV / Metal Halide lamp as the case may be.

The Post-top lantern type luminaires shall have a die-cast aluminium electrical unit/ housing with provision for pipe entry from below, a canopy made of spun aluminium and an opal white acrylic diffuser resistant to ultraviolet radiation and heat. The luminaire shall be rain proof, insect tight and fully wired upto the terminal block and suitable for use with 70/ 80/ 125 watt HPMV or 100 watt GLS Lamp as specified in the schedule of quantities.

The flood lighting luminaires shall have a rugged construction housing made of cast aluminium alloy of low copper content for corrosion resistant, highly polished and anodised aluminium reflector for beam control, a heat resistant front glass with gasket and terminal block. To facilitate aiming and fixing, bracket shall be provided on the housing. The luminaire shall be rain proof, and suitable for use with 1000 W tungsten halogen lamp or 250 / 400 Watt HPSV lamp/ metal halide lamp as specified in the schedule of quantities.

The ballasts for fluorescent tube shall conform to IS: 1534 & IS:1534(Part-I) 1977 and the same for high intensity discharge lamps shall conform to IS:6616-1982 and these shall have high grade synthetic enamelled copper winding wires, quality grade insulation materials, good quality low hysteresis losses electrical stampings, and complete unit shall have polyester filling. The ballasts shall be suitable for use on single phase 240 Volts 50 Hz. A.C. system and of approved make.

The capacitors shall comply with IS: 1569-1976 and be of hermetically sealed type.

4.20 EXHAUST FANS

The Exhaust fans shall conform to IS:2312-1967 and suitable for operation on 230/ 240 Volt single phase. 50 Hz. A.C. system. The fans shall be ring mounted type designed to give maximum air volume changes under free air flow conditions.

4.21 SWITCHES

Light and fan switches shall be rated for 6 amp. 250 volts and of Piano-key type and suitable for flush mounting on sheet steel board with moulded

bakelite cover (manufactured by switch manufacturer). The switches shall be of approved make & acceptable to the Engineer-in-Charge. The switches shall comply with relevant I.S.

4.22 SOCKET OUTLET AND PLUG

These shall be of 3 pin type and of rating 6 amps (for light) and 16 amps. (for power). Each socket outlet shall be complete with controlling switch and plug top. Protective fuse links shall be provided with 16 amps. power socket outlet. The socket outlets shall have piano-key type switches of approved make and acceptable to the Engineer-in-Charge. The socket outlet and plug shall comply with the relevant I.S. specifications.

4.23 SWITCH BOXES

Sheet metal (16 SWG) switch boxes/ connection boxes with 3 mm thick bakelite top cover flushed in wall by housing the box after cutting brick wall. Sheet metal boxes shall be treated against corrosion by passivation or other approved method.

4.24 FEEDER PILLAR

The feeder pillar shall be of the floor mounting type, totally enclosed and weather proof. The cubicle shall be fabricated out of heavy gauge sheet steel of thickness not less than 10 gauge with suitable side frames and 12 gauge stiffeners.

Hinged doors of not less than 3mm thick shall be provided at the front and rear of the cubicle to provide access for installations, operations, tests and inspection. All doors shall be fitted with dust excluding gaskets. The door shall also be fitted with suitable locking arrangement to prevent unauthorised opening. The cubicle shall be designed for mounting over cement concrete plinth by the roadside and shall be of substantial construction capable of withstanding the vibration normally experienced due to vehicular traffic.

The sheet steel materials used in the construction of the cubicle shall undergo a rigorous rust proofing process comprising alkaline degreasing, descaling in dilute sulphuric acid, cold rinsing and a recognised phosphating process. After metal treatment, the interior of the cubicle shall be painted with two coats of air drying red lead primer followed by two coats of air drying anti-condensation paint. The exterior of the cubicle shall be painted with two coats of red oxide primer and finished by application of two coats of enamel paint or any other colour shade acceptable to Engineer-in-Charge.

Ventilation louvers in the form of finely divided wire mesh shall be provided on the two sides to ensure natural ventilation.

4.25 TUBULAR POLE/G.I. PIPE POLES

Where tubular steel pole are specified (either swagged or stepped), the same should be manufactured and supplied as per I.S. 2713 part I to III - 1980. Where G.I. pipe pole are specified the same should be approved to I.S.

4.26 LOOP-IN JUNCTION BOX

The junction boxes shall be drip proof type dust and vermin proof construction fabricated from 2mm thick sheet steel having internal dimensions of 200 x 150 x 130mm depth for single phase distribution system and 250 x 200 x 130 mm depth for three phase distribution system. These shall have moulded Bakelite base connector block with anti-vibration nickel plated brass terminals of suitable size and rating and porcelain fuse fittings.

4.27 MANUFACTURER'S DRAWING

The successful tenderer shall submit for approval General arrangement and dimensioned drawings for Power and Lighting distribution switch board, Motor Control centre, Bus-duct arrangement, Miniature circuit breaker distribution board, Distribution board, Interlocked Switch socket outlets, Clock switch control panel, T P Power Cable junction box and cable rack etc. as required in three sets before commencing manufacture.

4.28 WORKMANSHIP AND INSTALLATION WORK

The workmanship shall be of good commercial quality and all supply materials and installation work shall be completed to the full satisfaction of the Engineer-in-Charge.

4.29 MANDATORY TEST

SL. No	Item Description	Nature of Test	Approved Specification	Remarks
1	H.T. Switchgear	a. Shop Test	IS: 10118,(Part-III)1982	All Routine Test including High Voltage Test
		b. Site Test	IS: 13118 –1991 IEC: 56-187	All Routine Test including High Voltage Test
2	Power Transformer	a. Shop Test	IS:2026-1977	All Routine Test including temperature rise Test
		b. Site Test	IS:10028(part-II)1981	All Routine Test including temperature rise Test
3	L.T. Switch Board, Dist. Board, Power Control Panel, Feeder Board	a. Shop Test	IS: 4237	2500V to withst for 1min. and Clearance and creepage to be check.
		b. Site Test	IS: 5039	Do
4	A.C.B	a. Shop Test	IS 2516 (Part I & II)1985	Shop test to be witnessed by NBCC. Test certificate to be produced.

		b. Site Test	Do	Operation of the breaker : Operation of protective devices; Indicating lamp to be checked.
		c. High Voltage test.	IS: 8023 (Part I)-1977	Dielectric test.
5	MCCB	a. Shop Test	IS: 2516 (Part I & II) 1985	Manufacturers Test Certificate to be furnished
		b. Site Test	Do	Operation of the breakers to be tested.
6	RCCB	a. Shop Test	IS: 12640	Manufacturers Test Certificate to be furnished
7	MCB	a. Shop Test	IS: 8828-1978 IEC: 898-1987	Manufacturers Test Certificate to be furnished
8	Wires/ Cables	a. Shop Test	IS : 694 IS : 1554	Manufacturers Test Certificate to be furnished
		b. Diameter of each strand of wires/ cables	IS: 8130	Diameter to be measured at site before use to confirm the correctness of the wire/ cables.
		c. Overall diameter	IS: 694 IS: 1554	Do
		d. Resistance	IS: 8730	Resistance of 100M of wires/cables to be measured.
9	Conduit Thickness		IS: 9537	Only ISI marked conduit to be used.
10	Earthing Earth Electrode Resistance.		IS: 3043-1978	Resistance to be measured.

6 PARTICULAR TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM

Risk Classification : Educational Building under Group B1 of NBC.

Fire Protection & Fire Alarm System

DESCRIPTION OF SYSTEM / INSTALLATION		REQUIREMENT AS PER N.B.C.	SYSTEM ENVISAGED
Hose reel		Required	To Provide with each down comer.
Down Comer		Not Required	To Provide 2 Nos. for Hose Reel only & 1 no. for Hose Reel & Landing Valve.
Yard Hydrant		Not Required	To Provide 1 No. including 1 No. F.B. Inlet.
Manual Electrical Fire Alarm System.		Not Required	Not To Provide
Automatic Detection & Alarm System.		Not Required	Not To Provide
i) Underground Fire Water Tank.		<u>Not Required</u>	Not To Provide
ii) Terrace Tank.		10,000 Ltrs.	To Provide 15,000 Ltr.
Pump (Fire / Jockey)	i) Near the under ground static tank.	<u>Not Required</u>	Not To Provide
	ii) At the Terrace level.	One electric Booster Pump of capacity 450 Lpm.	To Provide
Others	a) Portable Extinguisher. b) Fire Order / Notice. c) Exit Sign.	Required Required Required	To Provide To Provide To Provide

CODES & STANDARDS.

All the systems and equipments within the scope of this tender shall be of reputed proven makes, designed and manufactured in accordance with the stipulations of latest versions of Indian Codes or recommendations of State F.E.S / T.A.C. / F.O.C. / N.F.P.A.

When an equipment is offered conforming to standards other than those listed below, it shall be clearly brought in Schedule of Deviation.

01. IS:1646 : Code of practice for fire safety of building (general), Electrical Installations.
02. IS:1648 : Code of Practice for fire safety of buildings (general), Fire Fighting Equipment and its Maintenance.
03. IS:3034 : Code of Practice for Fire of Industrial Buildings, Electrical Generating and Distributing Stations.
04. IS:884 : First Aid Hose Reel for Fire Fighting (For Fixed Installations).
05. IS:2171 : Portable Fire Extinguisher, Dry Powder Type.

06. IS:2878 : Portable Fire Extinguishers, CO₂ type.
07. IS:1239 : Part - I : Mild Steel Tubes (upto 150mm).
Part - II : Mild Steel tubulars and other wrought steel pipe fittings.
08. IS:778 : Gunmetal gate, globe and check valves for general purposes.
09. IS:13095 : Butter Fly Valve.
10. IS:14846 : Sluice Valve for water works purposes (50 to 1200mm size) – Specification.
11. IS:5312 : Swing Check type Reflux (Non-Return) Valves.
12. IS:940 : Portable Fire Extinguisher ,Water CO₂ Type.
13. IS:10204 : Portable Fire Extinguisher, Foam Type.
14. IS:2190 : Code of practice for selection, installation and maintenance of portable First - Aid Fire Appliances.
15. IS:5290 : Landing / Hydrant Valve.
16. IS:8423 : Controlled Percolation Hose for fire fighting.
17. IS:903 : Fire Hose Delivery Couplings, Branch Pipe, Nozzles & Nozzle spanner.
18. IS:2062 : Structural Steel (Fusion / Welding Quality).
19. IS:325 : Three Phase Induction Motor.
20. NBC : National Building Code of India 2005, Group – 1, Part 4.
21. IS:2217 : Recommendations for providing first aid fire fighting arrangements in public buildings.
22. IS:3589 : Mild Steel Tubes (200mm and above).

TECHNICAL SPECIFICATION

01.00 PORTABLE FIRE EXTINGUISHERS.

- 01.01 All the portable extinguishers shall be of free standing type and shall be capable of discharging freely and completely in upright position. Each extinguisher shall have the instructions for operating the extinguisher on its body itself and shall be supplied with initial charge with accessories as required.
- 01.02 Portable type extinguishers shall be provided with suitable clamps for mounting on walls or columns and shall be painted with durable enamel paint of fire red colour, conforming to relevant Indian standards or NFPA standard 10.
- 01.03 The Water CO₂ type extinguisher shall comprise of suitable thickness sheet body coated with leaded tin alloy internally and externally (by electrolytic deposition process), an inner container, a CO₂ gas cartridge,

a plunger rod for CO₂ release and other accessories. It shall conform to IS:940.

01.04 Carbon-di-oxide type extinguisher shall comprise of high pressure steel cylinder body with wheel type valve, braided reinforced hose, non-conducting horns and accessories, wheeled trolley or mounting clamp, etc. It shall conform to IS:2878.

01.05 Dry chemical extinguisher shall comprise of suitable thickness sheet steel body coated with leaded tin alloy internally and externally (by electrolytic deposition process), an inner container, a carbon-di-oxide gas cartridge, a plunger rod for carbon-di-oxide release, a high pressure hose, a nozzle, a nozzle holder, wall mounting brackets and other accessories. It shall conform to IS:2171. The powder shall conform to IS:4861 or IS:4308.

01.06 Any other kind of portable fire appliances provided shall conform to NFPA standard 10 and of approved make.

02.00 FIRE WATER PUMP

02.01 The pump shall be of submersible type and designed for continuous operation at its best efficiency point. The drive unit of the pump shall be suitably rated, so that the same can take the load of full open condition. The pump set along with its drive unit shall run smoothly without undue noise and vibration. Parts of pump like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal.

02.02 Under certain conditions, there may be occasions when fluid flow through the pump would be reversed, as in case of loss of power to the pump drive. The pump should be so designed that the impellers and other accessories are not damaged under such conditions of flow reversal.

03.00 ELECTRIC MOTOR.

03.01 Notwithstanding anything stated in this specification, the motor has to satisfy the requirement of the mechanical system during normal and abnormal conditions. All motors shall conform to the latest applicable Indian Standard (IS:325) & IEC.

04.00 PUMP STARTING PANEL.

04.01 The panel should be of free standing floor / wall mounting consols as required and out of CRCA sheet steel. Suitable terminal blocks shall be provided for termination of external cable / wires. The panel feature shall be able to match the system description or philosophy for water based fire protection system.

04.02 The panel shall be suitable to accept electric feeding of 440 (10% Volts, 3 phase & 50HZ) 5% A.C. supply. The panel shall have the visual indication for power supply and of pump status. The starting interlock of the pump motor shall meet the system philosophy. The starter for Fire Pump shall be of Star-Delta type and that of Jockey Pump shall be of D.O.L. type.

- 04.03 The make of components and SLD of the panel shall be in accordance with the approval of Purchaser / Architect / Consultant.
- 05.00 HYDRANT / LANDING VALVE.
- 05.01 The Hydrant Valve (Alloy Steel) should conform to IS:5290 type 'A' and should be suitable for indoor or outdoor installation. The hydrant valve must be completed in all respect i.e. with blank cap & chain. It should have flanged inlet suitable for 80mm Nb and oblique type female instantaneous coupling outlet of 63mm size to receive male coupling as per IS:903.
- 06.00 PIPING
- 06.01 Mild Steel Black Pipe should be as per IS:1239, Part-I, medium / heavy grade. The complete piping system should withstand hydraulic test pressure equal to 1.5 times of maximum working pressure. Piping to be laid overground shall be supported properly on wall / column / beam / floor to suit site condition. Piping to be buried under ground shall be provided with protection of the outer surface, against soil corrosion by using two wrap of 2mm thick anticorrosion tape.
- 06.02 Outer surface of overground pipes shall be thoroughly cleaned of mill scale, rust etc. by wire brush, there after, one coat of red lead primer shall be applied. Finally two coats of synthetic enamel paint of approved colour shall be applied.
- 07.00 BRANCH PIPE WITH NOZZLE
- 07.01 The Branch Pipe (Aluminium) with Nozzle should conform to IS:903. The branch pipe should have male inlet connection of 63mm size at one end and other end should be threaded with a nozzle of 18mm bore.
- 08.00 HOSE WITH COUPLING.
- 08.01 63mm size controlled percolation hose should conform to IS:8423 and of 7.5 M / 15 M long. Both the end of the hose should be properly riveted and copper wire bounded with pair of male & female G.M. Hose Coupling as per IS:903.
- 09.00 FIRE SERVICE INLET (4 -WAY / 3 -WAY).
- 09.01 Fire Service Inlet connection should generally conform to IS:904 and complete with four / three 63mm dia instantaneous type gunmetal inlets with built in check valves and 150mm Nb / 100mm Nb connection for installation with the fire main.
- 10.00 SWINGING HOSE REEL.
- 10.01 First aid fire fighting swinging Hose Reel should conform to IS:884 and complete with reputed make 20mm dia rubber hose of 30 M / 33 M. long. It should be powder coated and should be complete in all respect i.e. with swivel joint, nozzle, etc.
- 11.00 SLUICE VALVE / GATE VALVE

- 11.01 Valves 40mm and below shall be heavy pattern gunmetal valves with cast iron wheel tested to 16 Kg./Cm² pressure. Valves shall be leader or equivalent make.
- 11.02 Sluice Valves 50mm and above shall be cast iron double flanged with non rising spindle. Sluice valves below ground shall be provided with suitable valve chamber. Sluice valves in exposed locations i.e. pumps house etc. shall be provided to with cast iron wheels. Sluice valves shall conform to IS:14846 class PN 1.0 and tested to 16 Kg/Cm² has pressure. Sluice valves shall be of approved make.
- 12.00 NON-RETURN VALVE
- 12.01 Non-Return valve shall be of cast iron double flanged & Swing Check type. The valve should have a permanent “ Arrow ” inscription on its body to indicate direction of flow of water. The valve shall generally conform to IS: 5312. The pressure rating of the valve shall be in accordance with the system design and the make shall be of approved type.

SAFETY SIGNAGE (EXIT SIGN WITH ARROW / FLOOR NUMBER)

- 13.01 The “Exit” Board & “Arrow” marking to indicate direction of escape route shall be of size 150mm X 300mm & 150mm X 150mm. The signage shall be of Photoluminescent nature. The signage shall get charged from the existing light present in the area and shall come alive to glow as soon as the light goes out by the luminous crystals containing mainly zinc sulphide in protective glass-like shell which is non toxic & non radioactive or non hazardous. The intensity of glow in the dark of the said signage shall decrease continuously but should last not less than 4 hours and strongest glow should produce during first 30 minutes of darkness.

APPROVED LIST OF MATERIALS

SL.No	NAME OF ITEMS	LIST OF APPROVED MANUFACTURERS / BRAND / APPLICATORS
	CIVIL	
1	Cement	ULTRATECH/ACC/LAFARGE/EQV.
2	Reinforcement	SAIL/TISCO/RINL.
3	Mild Steel and Medium tensile steel	Brand to be approved by the E-I-C.
4	White Cement	Birla, J.K
5	Ceramic Floor Tiles	NITCO, ORIENT, SOMANY, KAJARIA, JOHNSON
6	Ceramic Tiles for Dado	NITCO, ORIENT, SOMANY, KAJARIA, JOHNSON
7	Vitrified Tiles	NITCO, ORIENT, SOMANY, KAJARIA, JOHNSON
8	Chequered Tiles	NITCO, Basant Betons, Bezalal
9	Ironmongery	Subject to prior approval of EIC.
10	Cement based paint	Snowcem Plus or equivalent
11	Exterior grade textured paint	Asian Paint, Berger, ICI, Nerolac
12	Distemper	Asian Paint, Berger, ICI, Nerolac
13	Plastic emulsion Paint	Asian Paints, ICI, Berger, Nerolac
14	Synthetic Paint	Asian Paint, Berger, ICI, Nerolac
15	Zinc Chromate Primers	Shalimar, Asian Paint, Berger, ICI
16	Flush Door/ Block Board/ Ply	Kit ply, Sarda Ply, Kutty, Greenply, Tower
17	Glass	Modi/ Saint Gobin/ Asahi
18	Chemical / Mechanical Anchor Fastners	HILTI, FISCHER
19	Pre-coated anti-corrosive steel sheet	Colour roof (India) Ltd., Interarch Building Products Pvt. Ltd., Kirbey Building Systems Ltd.
20	Hydrolic door closer	Hardwyn make (Eddy) or equivalent
21	Floor spring for aluminium door	Hardwyn, Garnish
22	Fittings for Aluminium doors and windows.	Ebco, Doorline
23	Water Proofing Compound/ Admixtures	Choksey, Sika Qualcrete, Degussa, Fosroc, Roffe, Cico, Impermo, ACCO proof
24	Epoxy Paints	Choksey, Dr. Beck, Asian Paint, Garwara Paints.
25	Extruded Aluminium Sections	INDAL, JINDAL, Hindalco
26	Polysulphide Sealant	Choksey, Sika Qualcrete, Degussa
27	Gypsum False Ceiling	India Gypsum Ltd.
28	Polycarbonate Sheet	GE Plastic or Equivalent
29	PVC flooring	Armstrong, Birla Vinoleum, Polyfloor Challenger Vinyl flooring.
	SANITARY ITEMS	

1	Vitreous China Sanitary Ware	Parry, Cera, Hindustan
2	Plastic W.C seats	Commeander, Patel
3	GI Pipes	Tata, Jindal, NEZONE
4	GI fittings	HB, Zoloto, K.S
5	Stainless Steel Sink	Neelkantha, AMC, Corba
6	Mirror	Akoi, Atul, Silver, Fish, Jolly
7	C.P Pillar cock, Bibcocks, stop-cocks and other CP fittings	Essco, Parko, GEM, Jaquar
8	Brass Bib & Stop cock	GPA, SANT, L & K
9	Valves	Leaders, Kent, Zoloto
10	Soil, Waste & Rainwater pipe and fittings	
11	Unplasticised-PVC	Oriplast, Suprime, Prince
12	Sand Cast	RIF, BIG, NECO
13	Stonaware Pipes & Gully	Perfect, Burn
14	RCC Pipe	Laxmi, Sood & Sood, Jain & Co.
15	C.I. S/S Pipes	IISCO, Kesoram, Electro Steel
16	C.I. Manholes	Kirloskar, IVC
17	C.I. Double Flanged non-return	Kirloskar or equivalent
18	PVC Tank	Sintex, Patton
	ELECTRICALS	
1	ACB, MCCB, SFU,CFS, HRC Fuse	GE, MDS, Schneider, L & T, Siemens, Cromton Greaves, Power Control, C&S
2	TPN switch fuse unit / switch disconnecter fuse unit with HRC fuses	Siemens, L& T, GE, C&S, Schneider, Cromton Greaves, Power Control, Gerard, Indo Asian
3	DP/SPN SFU/ SDFUwith HRC fuse	LK, HPL, Havell's, L&T, Indo Asian, C&S
4	All moulded fuse with HRC fuses/Distribution fuse board with HRC fuses	Siemens, Larsen & Toubro, GE, C&S, Havell's, Gerard
5	KWH Meter	Alstom, HPL-SOCOMECH, L&T, Havell's, Jaipur
6	Motor Starter	Siemens, L& T, Schneider (CG), GE, T & C., BCH, C&S.
7	Rewireable type porcelain Switchgear, fuse fittings	Anchor, GE, Standard, Havell's, Gerard
8	Changeover Switch	L & T, ELECON/ Gerard, Havell's, Clipsal
9	Miniature Circuit Breaker & MCB Distribution Boards	MDS, Merlin Gerin, ELECON/ Gerard, L & T,Hager, Siemens, Havels, Legrand, Indo Asian.
10	Earth Leakage current circuit breaker	MDS, Merlin Gerin, L & T, Hager, Siemens, Gerard, Indo Asian
11	1100 Volts grade PVC insulated steel armoured and over all PVC sheathed cables with size	NICCO, Fort Gloster, National, CCI, Havell's, Polycab,

	in sq.mm embosed on cable surface	
12	PVC insulated stranded/ flexible copper conductor wire with size in sq.mm. embosed on cable surface (for internal wiring)	National (NC), Finolex, L&T, R.R. Kabel, Polycab, Havell's, Gerard, Indo Asian
13	Rigid PVC Conduit	B.E.C., Plaza, Kalingha, AKG, Precision, Gerard
14	Black stove enamelled conduit and galvanised steel conduit with ISI marked embosed on conduit surface	B.E.C., NIC, AKG
15	Decorative Electrical Switch Board cover with white top Lamination	Hylam or equivalent
16	Metal clad socket & plug having scraping earth arrangement	Hager, Schneider (CG), MDS, L & T, Gerard, Indo Asian, Havells. Indo Asian
17	250 Volt 6 Amp. Piano reed type switch/ Buzzer Push (Flush type), 250 Volt 16 Amp. 3 Pin socket with switch combined	Anchor, CPL, Precision
18	250 Volt 6 Amp. Ceiling rose, 250 Volt : 16 Amp 3 pin socket with switch combined	Anchor, CPL, Precision, SSK, Magic, Kolor
19	Clock switch/time switch	L & T, MDS, Hager, GIC, Indo Asian
20	'CLIP ON' Terminal assembly	Tosha, Elmex
21	Measuring Instrument (Ammeter, Voltmeter, P.F. meter).	Automatic Electric, Industrial Meter (I.M.P), Universal Electric, L&T, Rishab, NERCON
22	ON/OFF Rotary Switch/ Selector Switch/ programme switch	Siemens, Hager, Larsen & Toubro, Kaycee
23	Cable Glands	COMIC, Raychem
24	Cable Tray	Pilco, MEK
25	Battery	EXIDE, STANDARD
26	Fluorescent light fittings (All types) & lamp.	Philips,Thorn, Bajaj, Wipro, Crompton
27	Decorative wall bracket/ ceiling mounted Luminaire for PL /incandescent lamp	Philips,Thorn, Bajaj, Wipro, Crompton
28	Fluorescent Street Light Luminaire & lamp	Philips,Thorn, K-litr, Bajaj, Metal Coats
29	Metal halide luminaure & lamp	Philips,Thorn, K-litr, Bajaj, Metal Coats
30	Lamp Holder (Pendent racket or Batten)	Anchor, SSK, Magic
31	Exhaust Fan	G.E.C., Crompton, Polar, USHA

32	Ceiling Fan	Crompton, Orient, Polar, USHA
33	Ammeter/Voltmeter selector switch	Kaycee, L&T, Switron
34	Relay	Alsthom, GE, L&T, Syntron, Control Group
35	Current Transformer	Kappa, L&T, C&S, AE, SIEMENS
36	Capacitor	L&T, Manual, EPCOS
37	Sodium vapour, Murcury vapour MHL fittings and lamps	Philips, Crompton, Bajaj, Wipro
38	HT Switch Gear	MEI, Electrotecnica, BICCO, Siemens
39	Distribution Transformer	Eastern Transformer & Equipment, Truvolt, Voltamp
40	AC alternator	Kirlosker, Crompton, Stamford
	FIRE FIGHTING WORKS	
1	Fire Pump / Jockey Pump (Submersible type)	Kirloskar or Mather & Platt or K.S.B
2	C.I. Valves (Sluice / Non-return / Check)	H. Sarkar / KSB / Audco / Subhash Engineering.
3	M.S. / G.I. Pipe.	Jindal or Tata.
4	G.M.Valves.(gate / globe / check)	Leader or bearing ISI mark.
5	Hydrant / Landing Valve.	Ghosh Engineering / Asco Strumech.
6	63mm Fire Fighting Hose.	C.R.C. or Newage or B.R.G.
7	20mm Rubber Hose.	Dunlop or Diamond or Raihno.
8	Hose Box and Swinging Hose Reel.	Any fabricator, acceptable by local Fire Brigade authority.
9	Pressure Switch.	Indfoss / System Sensor.
10	Pressure Gauge.	H.Guru or Fiebig .
11	Portable Extinguishers.	D.Flame / Minimax/ Cease Fire
12	Power & Control Cable.	Gloster / Nicco / Phinox / Havells.

(For items not covered in above list of approved make, ISI make brands to used after obtaining prior approval from Engineer in Charge)
In case of non availability of makes mentioned above equivalent make brands may be used after obtaining prior approval from Engineer in Charge)