SHRI RAM COLLEGE OF COMMERCE
University of Delhi, Maurice Nagar, Delhi – 110007
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TENDER DOCUMENT

FOR

RECTIFICATION OF ELECTRICAL WORKS
IN NEW GIRLS HOSTEL BUILDING
SHRI RAM COLLEGE OF COMMERCE
UNIVERSITY OF DELHI, DELHI

INSTRUCTION TO TENDERERS, GENERAL CONDITIONS OF CONTRACT, SPECIAL TERMS & CONDITIONS , SPECIFICATIONS, SCHEDULE OF QUANTITIES

OWNER
SHRI RAM COLLEGE OF COMMERCE
UNIVERSITY OF DELHI
DELHI-110007
Phone: 27667905, 27666519

ARCHITECT
VIJAY GUPTA ARCHITECTS
603 CHIRANJIV TOWER
43, NEHRU PLACE
NEW DELHI-110019
Phone: 26414763, 26410790
Email: mail@vga.co.in

INDEX

1.0 NOITICE INVITING TENDERS

1.1 Sealed tenders on items rate basis are invited from approved / registered contractors with Government departments / PWD / University of Delhi by SHRI RAM COLLEGE OF COMMERCE, DELHI UNIVERSITY, DELHI for the following works to be executed inside the premises of the college.

Name of Project	:	Rectification of Electrical Works In New Girls Hostel Building Shri Ram College of Commerce, University of Delhi, Delhi
Estimated Cost	:	Rs. 17 Lakhs
Earnest Money	:	Rs. 85,000/- Only

1.2 The TENDER DOCUMENTS can be downloaded from SRCC website www.srcc.edu.

1.3 This Notice Inviting Tenders and enclosed specifications, General Conditions Contract, Special Conditions of Contract, Schedule of Quantities along with its Tender Drawings etc shall form the TENDER DOCUMENTS.

1.4 TENEDRS in two parts (A) One commercial bid and (B) One technical pre-qualification bid each separately sealed with the requisite Earnest money in the form of crossed Demand Draft (issued by any Nationalized or Scheduled Commercial Bank) and drawn in favour of SHRI RAM COLLEGE OF COMMERCE payable at New Delhi **shall be received upto March 20, 2020 , on working days between 10:00AM - 1:00PM & 2:00PM – 4:00PM** in the office of **Administrative Officer: Shri Ram College of Commerce.**

1.5 At first only the Technical Pre-qualification bid would be opened for evaluation and suitable parties/ contractors would be short listed. In the next stage only the commercial bids of such shortlisted parties would be opened, under intimation to them to enable their presence while Commercial bid opening. Commercial bids of all others, not pre-qualified would be returned unopened.

TENDERER is to quote on item rate basis and to assist him ,item wise quantities are stated in Schedule of Quantities. Although all precaution have been taken while working out the quantities but Owner / Architect does not take any guarantee for correctness of the same. The payment will be made for the actually executed and measured quantities at agreed rates.

1.6 The rates should be quoted in figures as well as in words and the respective amounts or total shall be given by each Tenderer. In case of any difference in rates in figures / word, those given in words shall hold good as quoted rate.

1.7 The tender shall remain valid for acceptance for 90 days from the last date of submission.

1.8 The successful TENDERER shall be intimated about the award of work and the Earnest Money Deposits of other Tenderers shall be returned without any interest on the amount deposited. The Earnest Money of the successful party shall be adjusted towards Security Deposit.

1.9 **The site is available and is free from any encumbrances and each Tenderer shall be deemed to have visited the site and seen the site conditions before quoting his Tender. No claim on ground for want of such knowledge / site inspection shall be entertained at any stage.**

1.10 The Owner reserves the right to reject any / all TENDERS without assigning any reason and shall not be bound to accept the lowest or any other Tender. The owner also reserves the right to accept the tender in full or in parts and in the latter case the tenderer is bound to execute the work at his quoted rates.

1.11 TENDER not accompanied by the requisite EARNEST DEPOSIT MONEY in the specified form, shall be summarily rejected.

1.12 Incomplete and late Tenders shall be rejected without any further reference.

1.13 The Time for Completion of work is **2 (Two) Months** from date of letter of award.

1.14 Corrigendum or any other related notices, if any, will only be put in the college website www.srcc.edu from time to time. Bidders are requested to check the website regularly.

Dated: _____March 2020

SHRI RAM COLLEGE OF COMMERCE

2.0 INSTRUCTIONS TO TENDERERS

2.1 Tender not properly filled, mutilated with calculation or generally not complying with the conditions may be rejected. Conditional tenders shall be summarily rejected.

2.2 TENDERERS should quote their rates both in figures and in words.

2.3 The schedule of quantities as mentioned must be fully priced and the total of each page along with carried over figures of the previous page shall be given in ink and Signed by the Tenderer.

2.4 If the tender is submitted by or on behalf of a company incorporated under the Company Act.(1959) it shall be signed by The Secretary or by one of the Directors duly authorised on their behalf. If it is, submitted by a partnership firm it shall be signed with the Co-partnership firm name by a member of the firm who shall sign his own name & give the name & address of each partner of the firm and attach a copy of Power of attorney with the tender authorizing him to sign on behalf of the partners. A certified copy of the registered partnership deed shall also be submitted along with the tender. The tender should be in a sealed cover.

2.5 A schedule of approximate quantities for various items accompanies the tender. It shall be definitely understood that the owner does not accept any responsibility for the correctness or completeness of the schedule in respect of items and quantities. This Schedule is liable to alteration by omission, deductions or additions at the discretion of The OWNER without affecting the terms of contract and without any extra claim on account of any reason or reasons.

2.6 All quoted rates shall include the cost of all materials & labour & transportation of materials to the site, all taxes such as Sales Tax, Turnover Tax, Sales Tax , Work Contract Tax, Royalties , Toll Tax , Income Tax , Excise Duty, Octroi, Cess etc. CONTRACTORS profit & overheads etc. and the fixing or placing in position for which the items of work is intended to be operated as per specifications, **excluding GST. Only GST shall be paid extra as applicable.**

2.7 No alteration shall be made by the tenderer in the Instructions to the TENDERERS or N.I.T ,Contract Form, Conditions of the Contract ,Drawings and specifications and if any such alterations are made or any special condition attached, the tender shall be rejected.

2.8 The acceptance of the tender rests with the OWNER, who reserves the right of rejecting any or all the tenders including the lowest tender without assigning any reasons what so ever.

2.9 The OWNER reserves the rights of accepting the whole or any part of a tender received and the tenderer shall be bound to perform the same at the quoted rates.

2.10 Every tenderer shall furnish along with the tender, Latest Income Tax clearance certificate & the GST Registration No. / Certificate from Sales Tax Deptt. for work Contract Tax etc. failing which his tender is liable to be rejected.

2.11 From the date of actual handing over of the works to the Owner, the contractor shall be responsible to make good any defects which may occur within a period of 12 months & this period is treated as "Defect Liability period"

2.12 The CONTRACTOR shall not be entitled to any compensation for any loss suffered by hindrance on account of delays in commencing or executing the work, whatever the cause for such delays may be including delays in procuring Government controlled or other materials.

2.13 The rates of different items are for all heights, depths, curvatures, and width unless otherwise specified in the item of work.

2.14 The detailed schedule of programme in the form of a BAR CHART for the whole work shall be drawn and submitted by the contractor within 10 days of the award of work. The work shall be progressed from day to day and completed in the order and according to the schedule after approval of the same by the Project-in-Charge.

2.15 If the OWNER wants to occupy areas in part, the contractor shall have to complete the work of these areas in consultation with the OWNER and hand over the same without affecting any of the clauses of contract agreement.

2.16 After acceptance of the tender the tenderers shall sign the necessary contract papers within 10 days from the receipt of the above intimation. In case of delay the "Earnest Money" may be forfeited and the tender cancelled or the contract enforced as per the terms of the tender and the tenderer shall thus be bound to execute the work even though the formal agreement has not been executed and signed.

2.17 **Electricity:** The contractor will make his own arrangement for electricity. The electric connection if required will be arranged by the Contractor himself. Necessary cabling etc. will be done by him at his cost and he will also pay for consumption at the prevailing rates of charges as per bills. The Contractor will purchase or hire generator to meet the requirement of electricity for the works and its cost for running / maintenance will be borne by contractor himself. The OWNER will have no responsibility in this connection.

2.18. **Water**: Contractor will make his own arrangement for water & further storage and piping etc. No. responsibility lies with the OWNER. The water used should be suitable for construction purpose and should be got tested from approved laboratory by Contractor at his own cost before start of the work. The running and

maintenance shall be done by the contractor at his own cost**.**

2.19 **Weathe**r: No extension of time will be allowed to the Contractor due to weather conditions prevalent in the area. The contractor is expected to take all the precautions at his own risk and cost so that the workmanship, the materials and progress of work are not affected in the inclement weather.

2.20 **Cleaning up & handing over**: Upon completion of the work all the site area should be cleaned . All works shall be cleaned in manner which will render the work acceptable to the OWNER. All rubbish shall be removed from the site and shall not be dumped in the surrounding area.

2.21 The work as described in the drawings and schedule of quantities shall be completed on or before the stipulated date of completion.

2.22 The CONTRACTOR shall be allowed to make a store rooms inside the premises.(Temporary)

2.23 The CONTRACTORS should quote their offer keeping in view the basic minimum rates of labour wages with upto date corrections as on the day of submission of the tender as per notification by Local Authorities.

2.24 The Contractor shall include in his rate all taxes viz Octroi, royalities, Sales Tax, Work Contract Tax, VAT , all duties & Cess etc and no claim on this account will be entertained. **Only GST shall be paid extra as applicable.**

2.25 The Income Tax /TDS and Work Contract Tax as specified will be deducted as per Govt. notification/regulation from the bills for paying to the Government & by the Employer.

2.26 The rate quoted by the Contractor shall remain firm till the work is completed.

2.27 Proper record for all the materials required for the above works shall be kept at site by the CONTRACTOR jointly with ENGINEER–IN–CHARGE.

2.28 Owner shall have the right to withdraw any item / items mentioned in the Tender from the Scope of the contractor at any time.

2.29 Contractor will have to take & deposit copy of "Workmen Compensation Policy" in respect of manpower deployed by it at the project site. Policy should be in the joint name of Owner & Contractor.

Dated ------March 2020 SHRI RAM COLLEGE OF COMMERCE

3.00 FORWARDING LETTER

From:

To

_____

_____

SUB : _____

Dear Sir,

With reference to the Tenders invited by you for the above work , I/ We do hereby offer to perform, provide, execute & complete the above work in conformity with the drawings,terms & conditions and specifications stipulated and accordingly submit the tender in Two parts separately as under-
Part A – Technical Pre-qualification Bid
Part B – Commercial Bid showing amounts in the Schedule of Quantities attached.

I/We have satisfied ourselves to the location and conditions of the site and have read the articles of agreement, conditions of contract & specifications etc. and we understand that the works is to be completed within the specified period & fully understand that the time will be the essence of this contract. I/We enclose herewith earnest money vide demand draft / pay order no……dt…….. for Rs. ……./- (Rupees ……. only) on the _____ _____of _____ in the name of …… (This amount shall not bear any interest and should this tender be accepted) I/ We, hereby agree that this amount will be forfeited if I / We, fail to start the execution within the stipulated time)

Name of the partners / Directors

Yours faithfully

1._____

Signatures

2._____ Date

3_____ Address

4.0 Articles of Agreement (Proforma)

ARTICLES OF AGREEMENT made on_____day of 2020 between _____ (hereinafter called "the OWNER") of the one part and M/s. _____ whose registered office situated at _____ (hereinafter " the CONTRACTOR") of the other part.

WHEREAS the OWNER is desirous of construction of _____ AND has caused Drawings and bills of quantities showing and describing the work to be done to be prepared by or under the direction of OWNER / ARCHITECT.

AND WHEREAS the CONTRACTOR has supplied the OWNER with a fully priced copy of the said bills of Quantities (which copy is hereinafter referred to as "the contract bills " and where as the said drawing (herein after referred to as "the Contract drawings") and the Contract bills have been signed by or on behalf of the parties hereto.

AND WHEREAS the CONTRACTOR has deposited the sum of Rs. ..... (Rupees ..... only) with the OWNER for the due performance of this agreement.

NOW IT IS HEREBY AGREED AS FOLLOWS: -

For the consideration hereinafter mentioned the CONTRACTOR will upon and subject to the conditions annexed carry out and complete with work shown upon the Contract Drawings and described by or referred to in the Contract Bills and in the said conditions.

The OWNER will pay the CONTRACTOR the sum of Rs. (Rupees ……only) or such other sum as shall become payable hereunder at the time and in the manner specified in the said CONTRACT .

The term "The ARCHITECT in the said conditions shall mean the said Architect appointed by the Owner or in the event of his death or ceasing to be the ARCHITECT for the purpose of this Contract, such other person as the OWNER shall nominate for that purpose.

The said condition and appendix thereto shall be read and construed as forming part of this Agreement, and the parties hereto shall respectively abide by and submit themselves to the conditions and perform the agreements on their parts respectively in such conditions contained.

Not withstanding anything contained in this agreement, OWNER shall have power to review the decisions / recommendations made or proposed to be made about any matter connected with the work to be executed under this contract, before / after these are implemented, call for additional information from the ARCHITECT / CONTRACTOR or any other source, hold discussions if necessary and arrive at his decision. This decision would be applicable for the work. If the CONTRACTOR feels aggrieved by this decision, he would be free to raise this matter as a dispute for arbitration, under the agreement but would not stop the work on any pretext and proceed with the work in accordance with this decision.

As witness the hands of the said parties.

Signed by the said in the presence of OWNER

Witness

Name

Address :

Signed by the said in the presence of

Witness

Name CONTRACTOR

Address:

5.00 APPENDIX TO GENERAL CONDITIONS OF CONTRACT SCHEDULE OF FISCAL ASPECTS

NAME OF WORK	:	RECTIFICATION OF ELECTRICAL WORKS IN NEW GIRLS HOSTEL BUILDING, SHRI RAM COLLEGE OF COMMERCE, UNIVERSITY OF DELHI, DELHI.
DEFECT LIABILITY PERIOD	:	12 months after completion of entire work. During. Defect Liability Period of 12 months the contractor will depute his staff for attending to all types of construction defects included under his scope of contract and rectify the defects free of cost.
PERIOD OF FINAL MEASUREMENTS AND VALUATION	:	Within 2 (two) months from date of handing over the work. Payment of final bill shall be done only after the commissioning certificate issued by the Architect/ Consultant.
DATE OF COMMENCEMENT	:	Within 7 (Seven) days of issue of the award letter from the Owner.
TIME FOR COMPLETION	:	The whole works will be completed within 2 (Two) Months
AGREED LIQUIDATED DAMAGES	:	The quantum of liquidated damages shall be 0.1% of the contract sum of the works per day of delay subject to maximum of 5% of the Contract value.
SECURITY DEPOSIT PERCENTAGE	:	5% from Gross amount of each bill as per conditions of contract. Earnest Money will be adjusted towards Security Deposit.
LIMIT OF SECURITY DEPOSIT	:	5% of the Gross amount of work.
REFUND OF SECURITY DEPOSIT AFTER VIRTUALCOMPLETION	:	100% shall be released after defect liability period of 12 months subject to all defects rectified by the contractor.
MOBILISATION ADVANCE	:	No Mobilisation Advance will be paid.

TECHNICAL PRE-QUALIFICATION REQUIREMENT

The technical pre-qualification bid includes:

1. Certificate/ License from the Government departments / PWD / University of Delhi
2. PAN No. (Self attested copy enclosed with date)
3. GST No. (Self attested copy enclosed with date)
4. Certificate with respect to registration of the firm/ organization under the relevant law.
5. Statutory Licenses obtained (if any).
6. Earnest Money Deposit (EMD) in a separately sealed envelope.
7. Company Profile, brochure showing turnover of the company for the last three years.
8. Last Three Year's Income Tax Clearance Certificate.
9. List of the Technical Personal with brief Bio-data – Qualification & Experience.
10. List of Tools, Plant and Machinery.
11. Performance Certificate issued by Client of Running Projects.
12. Performance Certificate issued by Client of Completed Projects. Documents in support of executing similar works (on the basis of estimated cost) in Govt. Departments/Ministries, PSUs/academic institutions/ private institutions of repute during the last 5 years.
13. Dispute pending with any client for work done in preceding five (5) years. If none, an affidavit to the effect.
14. Delay, if any, in execution of earlier projects completed in last three years. The delay period along with reasons.

QUALIFICATION CRITERIA:

The party should have satisfactorily executed at least 3 jobs of similar nature in the last three years, each value not less than 40% of the Estimated Cost of this tender work.

OR

Should have satisfactorily executed at least 2 jobs of similar nature in the last three years, each value not less than 60% of the Estimated Cost of this tender work.

OR

Should have satisfactorily executed at least 1 jobs of similar nature in the last three years, each value not less than 80% of the Estimated Cost of this tender work.

(Should submit attested copies of Completion & Performance Certificates.)

HOW TO APPLY:

All the above papers along with qualification Criteria enumerated but excluding the EMD, should be submitted in a sealed envelope marked "TECHNICAL PRE_QUALIFICATION BID" The EMD should be in a separately sealed envelope which will be considered along with the Technical Pre-qualification bid.

After evaluation, including if necessary actual visit by evaluating committee to the completed works cited by the intending parties, the college would put up the list of all the pre-qualified parties and date of opening of Commercial Bid in the college website. In case of all other parties not pre-qualified, the EMD & their respective unopened Commercial Bids would be return back.

College reserve the right to reject any or all the applications without assigning any reason whatsoever.

1

6.0 GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

1.1 The contract document consists of the Agreement, the General Conditions of the Contract, Special Terms & Conditions, Specifications and Schedule of Quantities and Rates contained therein including all modifications thereof incorporated in the document before execution and the Contract Drawings prepared by the OWNER / ARCHITECT from time to time.

The OWNER
The ARCHITECT
The CONTRACTOR
The ENGINEER-IN-CHARGE

Are those mentioned as such in the Agreement and shall include their legal representatives, assigns or successors. They are treated throughout the Contract Document as if each were of the singular number and masculine gender.

1.2 "The Site" shall mean the site of the contract work including any building and erections thereon and any other land allotted by the OWNER for Contractor's use.

1.3 The term "Sub-contractor", as employed herein, includes those having a direct contract with the Contractor. and it includes one who furnishes material worked to a special design according to the plans or specifications of this work but does not include one who merely furnishes material not so worked

Anyone doing work on a piece rate basis shall be deemed to be a Sub-contractor.

1.4 "Written notice" shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an office of the corporation for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

1.5 The term " Work " of the Contractor or Sub-contractor includes labour or material or both

1.6 All time limits stated in the Contract Document are the essence of the Contract.

1.7 The law of the place of work shall govern the construction under the contract.

1.8 The date of virtual completion of a work or specified area of a work is the date when construction/work is sufficiently completed, in accordance with the Contract Documents as modified by any change or variation orders agreed to by

the parties, so that the OWNER can occupy the works for the use it was intended.

2 CONTRACT DOCUMENT

The following documents shall constitute the contract document:

i) Notice inviting Tender
ii) Instruction to Tenderers
iii) Articles of Agreement
iv) General Conditions of Contract
v) Special Conditions of Contract
vi) Specifications
vii) Schedule of Quantities
viii Drawings

All parts of the Contract document are complementary, what is called for in any one shall be binding, as if called for by all

The Contract Document shall remain in the custody of the OWNER so as to be available at all reasonable times for the inspection of the ARCHITECT or of the Contractor. Immediately after the execution of the contract one copy of the Contract Document and two copies of the Contract Drawings shall without charge be supplied by the OWNER / ARCHITECT to the Contractor and one copy of the Contract Document retained with him. Original contract documents and two sets of contract drawings will be sent to the OWNER.

After the execution of the contract two copies of the Specifications, descriptive schedule or other like document necessary for use in carrying the work shall without charge be supplied by the OWNER / ARCHITECT to the Contractor

Provided that nothing contained in the said Specification, Descriptive schedules or other document shall impose any obligation beyond those imposed by the Contract Document namely by the Contract Drawings, the Contract Bills, the Articles of Agreement and these conditions

After the award of the Contract, the Contractor shall without charge be supplied with all such further drawings and details as may be prepared by the OWNER / ARCHITECT and his CONSULTANT, from time to time as the work proceeds as are reasonably necessary either to explain or amplify the Contract Drawings or to enable the Contractor to carry out and complete the work in accordance with these Conditions. Provided all such drawings shall be a reasonable development of the work described in the Contract Document.

The Contractor shall keep one copy of the Specifications, Descriptive schedule or other like documents referred to in this clause and one copy of the contract Drawings and such other drawings and details supplied to him from time to time

and referred to in this clause and written instructions referred to in clause and sub-clauses 9,16.1 ,16.2 and 29 upon the site so as to be available to the OWNER / ARCHITECT or his representative at all reasonable times.

None of the documents herein before mentioned shall be used by the CONTRACTOR for any purpose other than this contract and neither the OWNER nor the ARCHITECT shall divulge or use except for the purpose of this contract any of the prices in the contract bills.

Upon final payment under clause 30.6 of these conditions the Contractor shall if so requested by the OWNER / ARCHITECT forthwith return to the OWNER / ARCHITECT all Drawings, Details, Specifications, Descriptive Schedule and other Documents of like nature which bears his name or that of the CONSULTANT.

3 TYPE OF CONTRACT

The Contract shall be an item rate contract. The contractor shall be paid for the actual quantity of work done, as measured at site, at the rates quoted by him in the "Schedule of Quantities and accepted by OWNER.

4 SCHEDULE OF QUANTITIES

The quantities given in the Schedule of Quantities are provisional and are meant to indicate the intent of the work and to provide a uniform basis for tendering. The OWNER reserves the right to increase or decrease any of the quantities up to any extent or to totally omit any item of work and the Contractor shall not claim any extra or damages on these grounds. Any error in description or in quantity or omission of items from the Schedule of Quantities shall not vitiate this Contract but shall be treated as a variation.

5 CONTRACT DRAWINGS

5.1 In general the drawings shall indicate dimensions, position and type of construction, the Specifications shall indicate the qualities and the methods; and the Schedule of Quantities shall indicate the quantum and the rate for each item of work. Any work indicated on the Drawings and not mentioned in the Specification or vice versa shall be furnished as though fully set forth in both. Work not specifically detailed called for, marked or specified shall be the same as similar parts that are detailed, marked or specified

5.2 The Contractor's work shall not deviate from the Drawings and Specification. The OWNER / ARCHITECT interpretation of these documents shall be final and without appeal.

5.3 Errors or inconsistencies discovered in the Drawings and Specification shall be promptly brought to the attention of the OWNER / ARCHITECT, through the

ENGINEER-IN-CHARGE, for interpretation or correction. Local conditions which may affect the work shall likewise be brought to the OWNER / ARCHITECT attention. If at any time it is discovered that the work is being done which is not in accordance with the Contract Drawings and specifications, the Contractor shall correct the work immediately. Corrections of defective work shall not be a basis for any claim for extension of time or for any additional sum (s). The Contractor shall not carry on work except with the knowledge of the ENGINEER-IN-CHARGE.

5.4 Figured dimensions on the Scale Drawings and large size details shall govern. Large size details shall take precedence over small scale drawings. Any work done before receipt of such details, if not in accordance with the same, shall be removed and replaced or adjusted, by the Contractor without expense to the OWNER. The general conditions apply with equal force to all the work including authorized extra works.

5.5 All drawings, Schedule of Quantities and Specifications and copies thereof furnished by the OWNER / ARCHITECT are his property. They shall not be used on any other work and shall be returned to the OWNER / ARCHITECT at his request on completion or termination of the Contract.

6.0 CONTRACT SUM

The "Contract Sum" shall not be adjusted or altered in any way whatsoever otherwise than in accordance with the express provisions of these conditions, and subject to clause 5.2 of these conditions. Any error whether of Arithmetic or in the computation of the Contract Sum shall be deemed to have been accepted by the parties hereto

7.0 CONTRACT BILLS

Monthly payments: Based on measurements recorded in a Measurement Book (MB) by Contractor and Contractor's respresentative, the Contractor will submit his bill in quadruplicate in approved proforma along with MB monthly for payment. The MB and the submitted Bill would be verified and certified for payment by Engineer in Charge / Architect. All such payments shall be considered as advance payment against Final bill. The bill shall be deemed to have been prepared in accordance with the principles of the standard method of measurement of Building works.

Any error in description or in quantity or omission of items from the contract bills shall not Vitiate this contract.

8. SCOPE AND INTENT

8.1 **Scope**: The general character and the scope of the work is illustrated and defined by

the Specifications and the Schedule of Quantities herewith attached and by the signed Drawings. If the Contractor finds any discrepancy in or divergence between the "Contract Drawing" and or the "Schedule of Quantities " he shall immediately give to the OWNER / ARCHITECT a written notice specifying the discrepancy or divergence and the OWNER / ARCHITECT shall issue instruction in regard thereto.
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Extent: The Contractor shall carry out and complete the work in every respect in accordance with the contract and with the directions of and to the reasonable satisfaction of the OWNER / ARCHITECT The OWNER / ARCHITECT may in his absolute discretion and from time to time issue further drawings, details and/or written instructions, written directions and written explanations all of which collectively referred to as OWNER / ARCHITECT instructions All such Drawings and instructions shall be consistent with the Contract Document, true development thereof and reasonably inferable therefrom.

8.3 **Intent:** The intention of the documents is to include all labour and materials equipment and transportation necessary for the proper execution of the work, including all taxes. Materials of work described in words which so applied have a well known technical or trade meaning shall be held to refer to such recognized standard.

9.0 OWNER / ARCHITECT'S INSTRUCTIONS

9.1 The Contractor shall forthwith comply with and duly execute any work comprised in such instructions issued to him by the OWNER /ARCHITECT in regard to any matter in respect of which the OWNER / ARCHITECT is expressly empowered by these conditions to issue instructions, provided always that verbal instructions, directions and explanations given to the Contractor or his work representative by the OWNER /ARCHITECT shall, if involving a variation, be confirmed in writing.

If within seven days after receipt of a written notice from the OWNER /ARCHITECT, requiring compliance with an instruction the Contractor does not comply herewith, then the OWNER may employ and pay other persons to execute any work whatsoever which may be necessary to give effect to such instructions and all cost incurred with such employment shall be recoverable from the Contractor by the OWNER as a debt or may be deducted by him from any monies due or to become due to the Contractor under this Contract.

9.2 All instructions issued by the OWNER /ARCHITECT shall be in writing. It should be given to the Engineer in Charge and then passed on to the contractor Any instruction issued orally shall be of immediate effect but shall be confirmed in writing by the Contractor to the OWNER /ARCHITECT within seven days and if not dissented in writing by the ARCHITECT to the Contractor within seven days from receipt of the Contractor's confirmation it shall be taken as from the expiration

of the latter said seven days.

9.3 **Provided Always**

9.3 A That if the OWNER / ARCHITECT within seven days of giving such an oral instruction himself confirms the same in writing,

10. FACILITIES AND CO-OPERATION

In the case of works indicated on the Drawings but not included in the contract, the Contractor shall provide necessary facilities and co-operation for any Sub-contractor or supplier who may be approved by the OWNER / ARCHITECT. The Contractor shall do all cutting, filling or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other CONTRACTORS shown upon or reasonably implied by the Drawings and Specifications for the completed structure and he shall make good after them as the OWNER / ARCHITECT may direct. Any cost caused by the defective or ill-timed work shall be borne by party responsible therefore. The Contractor shall not endanger any work by cutting; excavating or otherwise altering the Work and shall nor cut or alter the work of any other Contractor save with the consent of the OWNER / ARCHITECT.

11 **SETTING OUT**

The Owner /Architect shall determine any lines, levels which may be required for the execution of the work and shall furnish to the Contractor by way of accurately dimensioned drawings such information as shall enable the Contractor to set out the work at ground level.

The Contractor shall set out and level the work and shall be responsible for the accuracy of the same. He shall provide all the instruments and attendance required by the OWNER / ARCHITECT for checking the work. He shall entirely at his own cost amend to the satisfaction of the OWNER / ARCHITECT any error found at any stage which may arise through inaccurate setting.

2

12 **SITE**

12.1 **Visit:** Before tendering, the Contractor shall have visited and examined the site and satisfied himself as to the nature of the existing roads or other means of communication and the character of the soil and of the excavations, the correct dimensions of the work and the facilities for obtaining any special articles called for in the Contract Document and shall have obtained generally his own information on all matters affecting the continuation and progress of the works.

No extra charge made in consequence of any misunderstanding or incorrect

information on any of these points, or on the grounds of insufficient description, will be allowed. Should the Contractor after visiting the site, find any discrepancies, omissions, ambiguities or conflicts in or among the Contract Documents, or to be in doubt as to their meaning he shall bring the questions to the OWNER / ARCHITECT's attention, not later than three days before the last date for submission of the tender.

12.2 **Possession:** The Contractor shall be allowed admittance to the site on the Date of Commencement stated in the appendix and he shall thereupon and forthwith begin the work and shall regularly proceed with and complete the same on or before the Date of Completion stated in the appendix subject nevertheless to the provision for extension of time hereinafter contained.

12.3 **Treasures :** Any Treasures, Coins or objects of Antiquity, which may be found at site shall be handed over to the OWNER.

12.4 All dismantled materials and excavated stone shall be the property of the OWNER. All useful stone / materials shall be stacked/ stored properly and handed over to the ENGINEER-IN-CHARGE against proper receipt. No extra cost will be paid to the Contractor for such operation.

13 SAMPLES AND SHOP DRAWINGS

13.1 After the award of the Contract, the Contractor shall furnish for the approval of the OWNER / ARCHITECT, with such promptness as to cause no delay in his work or in that of any other Sub-contractor, samples and shop drawings required by the specifications or by the OWNER / ARCHITECT. Samples shall be delivered as directed by the OWNER / ARCHITECT.

13.2 A schedule giving dates for the submission of samples shall be included in the schedule described under clause 14. Unless specifically authorised, all samples must be submitted for approval within Ten days of signing the Contract and not less than twenty days before the date the particular work involved, is scheduled to begin.

13.3 The OWNER / ARCHITECT shall check and approve such samples, with reasonable promptness only for conformity with the design concept of the works and for compliance with the information in the Contract Documents. The work shall be executed in accordance with the approved samples.

14. PROGRESS CHART

The Contractor shall prepare programme ,progress and PERT charts and submit the of the OWNER/ ARCHITECT and for his record within 10 days of the award of the Contract. The charts shall indicate the expected date of commencement and completion of each of the items of work and shall be in a form approved by the OWNER / ARCHITECT. The Chart shall also indicate the scheduling of samples,

Submission of Shop Drawings and approvals.

15 ACCESS FOR OWNER / ARCHITECT TO THE WORKS

The OWNER / ARCHITECT and their representatives shall at all reasonable time have access to Works and to the workshop or other places of the contractor where work is being prepared for the Contract and when work is to be so prepared in workshop so other places of a Sub-contractor (whether or not a nominated Sub-contractor as defined in clause 26 of these conditions) the contractor shall have a term in the Sub- contract so as to secure a similar right of access to those workshop or places for the OWNER/ ARCHITECT and his representatives and shall do all things reasonably necessary to make such right effective.

3

16 ARCHITECTS' STATUS AND DECISIONS

16.1 The ARCHITECT shall be the OWNER's representative. The ARCHITECT shall periodically visit the site for designs, supervision with the progress and the quality of the work and to determine in general if the work is proceeding in accordance with the Contract Document. During such visits and on the basis of the observations while at the site he shall keep the OWNER informed of the progress of the work, shall endeavor to guard the OWNER against defects and deficiencies in the work of the Contractor and he shall reject work which fails to conform to the Contract Document. He shall have authority to stop the work whenever such stoppage may be necessary in his reasonable opinion to ensure the proper execution of the Contract. The Architect will immediately inform the owner of such stoppages.

ARCHITECT shall be in the first instance the interpreter of the Conditions of the Contract and the judge of its performance. He shall side neither with the owner nor with the contractor but shall use his powers under the contract to enforce its faithful performance by both. In case of termination of the appointment of the ARCHITECT, the OWNER shall appoint a capable and reputable ARCHITECT / ENGINEER IN CHARGE against whom the Contractor shall have no objection and whose status under Contract shall be that of the former ARCHITECT.

16.2 **Decision:** The OWNER shall within a reasonable time take decisions on all claims of the Contractor and all other matters relating to the execution and progress of the work or the interpretation of the Contract Document.

ARCHITECT may in his absolute discretion and from time to time issue further Drawings, Details and/ or written instructions, written directions and written explanations in regards to the followings and inform the owner of the same.

a) Variation or modification of the design
b) The quality or quantity of works or the additions or omission or substitution of any work

c) Any discrepancy in or divergence between the Drawings and / or specifications
d) The removal and / or re-execution of any works executed by the Contractor.
e) The dismissal from the works of any persons employed thereon.
f) The opening up for inspection of any work covered up.
g) The amending. and making good of any defects under Defects Liability Period.
h) The removal from the site of any materials brought thereon by the Contractor and the substitution of any other material therefor .
i) Assignment and sub-letting.
j) Delay and extension of time
k) The postponement of any work to be executed under the provision of this Contract.

16.3 **Dismissal:** The Contractor shall on the instructions of the Engineer in Charge / ARCHITECT immediately dismiss from the works any person employed thereon by him who may in the opinion of the Engineer in Charge / ARCHITECT be incompetent or misconducts himself and such person shall not be again employed on the work without the permission of the Engineer in Charge / ARCHITECT.

17 SECURITY DEPOSIT

The person/persons whose tender(s) may be accepted (hereinafter called the Contractor) shall permit OWNER to deduct such sum at the rate of 5% of the Gross value of the work done from each Running Bill at the time of making any payment to him for work done under the contract, Such total deduction shall be made by the OWNER by way of Security Deposit subject to a Maximum of 5% of the contract sum, which shall be released after defect liability period of 12 months subject to finalization of bills and all defects being rectified by the Contractor. All compensation of other sums of money payable by the Contractor under the terms of this contract may be deducted from or paid out of his security deposit from or may become due to the Contractor by the OWNER on any account whatsoever and in the event of Security Deposit being reduced by reasons of any such deductions the contractor make good the same in cash within 10 days. The Security Deposit shall be collected from the running bills of the Contractor at the rate mentioned above and the earnest money deposited at the time of tenders will be treated as part of the Security Deposit and to be adjusted.

18 ENGINEER-IN-CHARGE

The term "ENGINEER-IN-CHARGE" shall mean the person nominated by the OWNER and appointed and paid by the OWNER . and acting under the instructions of the OWNER to inspect the works in the absence of the OWNER / ARCHITECT. The Contractor shall afford the ENGINEER-IN-CHARGE every facility and assistance for inspecting the works and materials and for checking and measuring the work and the materials. Neither the ENGINEER-IN-

CHARGE nor any representative of the ARCHITECT/OWNER shall have power to set out works or to revoke, alter, enlarge or relax any requirements of the Contract or to sanction any day work, additions, alterations, deviations or omissions, of any extra work whatever except in so far as such authority may be specially conferred by a written order of the OWNER / ARCHITECT.

The ENGINEER-IN-CHARGE or any representative of the OWNER / ARCHITECT, shall have power to give notice to the Contractor or to his representative of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the ARCHITECT , is obtained. The work will from time to time be examined by the ARCHITECT, the ENGINEER-IN-CHARGE or the ARCHITECT'/OWNER representative but such examination shall not in any way exonerate the Contractor from the obligation to remedy any defects which may be found to exist at any stage of the work or after the same is completed subject to the limitation of this clause, the Contractor shall take instructions from the ARCHITECT/OWNER/ENGINEER INCHARGE.

19 CONTRACTOR'S FIELD ORGANISATION AND EQUIPMENT

19.1 **Site Engineer:** The Contractor shall constantly keep on his work during its progress qualified and competent Site Engineer who will be responsible for the carrying out of the works to the true meaning of the Drawings, Specifications and Schedule of the Quantities, OWNER / ARCHITECT instructions and directions to the satisfaction of the OWNER / ARCHITECT. Any directions or instructions given to him by the OWNER / ARCHITECT shall be deemed to have been issued to the Contractor. Attention is called to the importance of requesting instructions from the OWNER / ARCHITECT before undertaking any work where OWNER / ARCHITECT's directions or instructions are required. Any such work done in advance of such instructions will be liable to be removed.

19.2 **Equipment:** The Contractor shall provide and install all necessary hoists, ladders, scaffolding, tools, tackles, plants, all transport for labour materials and plant necessary for the proper carrying on execution and completion of the work to the satisfaction of the OWNER / ARCHITECT.

19.3 **Office Accommodation:** The Contractor shall provide / erect and maintain where directed simple waterproof office accommodation for the site engineers & supervisors etc.

19.4 **Watchmen:** The Contractor shall make his own security arrangements to guard the Site and premises at all times, at his own expense. The security arrangement shall be adequate to maintain strict control on the movement of material and labour. The Contractor shall extend the security arrangement to guard the material stored and /or fixed on the premises by the Sub-contractors.

19.5 **Storage of Materials:** The Contractor shall provide, erect and maintain proper

sheds for the storage and protection of the materials etc. against fire, theft, Rains etc.and also for the execution of work which may be required on the site.

19.6 **Sanitary Conveniences:** The Contractor shall provide and erect all necessary sanitary convenience for Site staff and the workmen, maintain in a clean orderly condition and clean and deodorize the ground after removal.

19.7 **Scaffolding, Staging, Guardrails:** The Contractor shall provide scaffolding, staging, guardrails, temporary stairs which shall be required during construction. The support for the scaffolding, staging, guardrails and temporary stairs shall be strong, adequate for the particular situation. The temporary access to the various parts of the works under construction shall be rigid and strong enough to avoid any chance of mishaps. The arrangement proposed shall be subject to the approval of the OWNER / ARCHITECT.

4

20 TAXES

The Contractor shall include in his rates the various taxes such as octroi, excise duty, sales tax turnover / works contract tax, VAT and any other tax payable and it shall be assumed that his rates cover for all taxes Royalties, Excise duties, Toll Tax, duties, Cess etc and no claim on this account will be entertained. **Only GST shall be paid extra as applicable.**

21 STATUTORY OBLIGATIONS, NOTICES, FEES AND CHARGES

The Contractor shall comply with and give all notices required by any government authority, and instrument, rule or order made under any Act of Parliament or any regulation or Bye-law of any local authority relating to the work or with whose system the same is or will be connected. The Contractor before making any variation from the Contract Drawings or Contract Bills necessitated by such compliance shall give to the OWNER / ARCHITECT a written notice specifying and giving reasons for such variations and the Engineer in Charge / ARCHITECT may issue instructions in regard thereto. If within 10 days of having given the said written notice the Contractor does not receive any instruction in regard to the matters therein specified, he shall proceed with the work confirming to the Act of parliament instrument,'rule-order, regulations or Bye-law in question and any variation thereby necessitated shall be deemed to be a variation required by the OWNER / ARCHITECT.

21.2 The Contractor shall pay and indemnify the OWNER against liability in respect of any fees or charges (including any rates and taxes) legally demandable under any Act of Parliament rule or order or any regulation or Bye-law or any local authority in respect of the Work.

22 ROYALTIES AND PATENT RIGHTS

All royalties or other sums payable in respect of supply and use in carrying out the work as desired by or referred to in the Contract Bills of any patented articles, process or inventions shall be deemed to have been included in the Contract Sum, and the Contractor shall indemnify the OWNER from and against all claims, proceedings, damages, costs and expenses which may be brought or made against the OWNER or to which he may be put by reason of the Contractor infringing or being held to have infringed any patent rights in relation to any such articles , processes and inventions.

23 **LICENSES & PERMITS FOR MATERIALS UNDER GOVERNMENT CONTROL**

Licenses and permit for all materials under Government control shall be obtained by the Contractor through the collaboration and help of OWNER, the Contractor shall include in his tender all transport charges and other expenses likely to be incurred to bring materials to the Site.

24 **ASSIGNMENT OR SUB-LETTING**

The Contractor shall not without the written consent of the OWNER / ARCHITECT assign or sub-let any portion of the work.

25 **SUB-CONTRACTOR**

As soon as practicable and before awarding any sub-contract, the Contractor shall notify the OWNER / ARCHITECT in writing the names of the Sub-contractor proposed for the principal parts of the work and for such other parts as the OWNER / ARCHITECT may direct, and shall not employ any agency to whom the Architect or the OWNER may have any objection.

The OWNER / ARCHITECT / ENGINEER IN CHARGE however, shall have power to obtain estimate and select other Agencies to carry-out any of the work as described in this Contract Document..

26 **ARTISTS AND TRADESMEN**

The CONTRACTOR shall permit the execution of work not forming part of this contract by artists, tradesmen, or others engaged by the OWNER. Every such person shall for the purposes of clause 43 of these conditions be deemed to be a person for whom the OWNER is responsible and not be Sub-contractor

27 **SEPARATE CONTRACT**

The OWNER reserves the right to let other CONTRACTORS work at site in connection with this work. The Contractor shall afford other Contractor reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly co-ordinate his work with theirs. If

any part of Contractor's or Sub-Contractor' s work depends for proper execution or results upon the work of any other Contractor, or Sub-Contractor, the Contractor shall inspect and promptly report to the OWNER / ARCHITECT any Defects in such work that render it unsuitable for such proper execution and results. Failure of the CONTRACTOR to so inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper except as to defects which may develop in the other Contractor's or Sub-contractor's work after the execution of the work, to ensure the proper execution of his subsequent work the Contractor shall measure work already in place and shall at once report to the OWNER / ARCHITECT any discrepancy between the executed work and the drawings

28 **VARIATIONS**

The OWNER / ARCHITECT shall have power to make any alterations or omissions, additions, substitution for the original specifications, drawings, design and instructions, in consultation with the owner that may appear to him to be necessary during the progress of the work. The Contractor shall carry out the work in accordance with any instruction which may be given to him in writing signed by the OWNER / ARCHITECT and such alterations, omissions, additions or substitution shall not invalidate the contract and orders etc. Any altered, additions or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respect on which he agreed to do the main work.

i) If the rates for the additions, altered or substituted work are specified in the contract for the work the Contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract for the work.

ii) If the rates for additional, altered or substituted work are not specifically provided in the contract for the work the rates shall be derived from the rates for a similar class of work as are specified in the contract for the work. .

iii) If the altered, additional or substituted work includes any work for which no rates is specified in the contract for the work and cannot be derived from the similar class of work in the contract, then such work shall be carried out at the rates entered in Schedule of Rates DSR 2018 with up to date correction slips minus / plus percentage .

iv) If the rates for the altered, additional or substituted work cannot be determined in the manner specified in sub-clauses (i) to (iii) above, then the contractor shall within 7 days of the date of receipt of order to carry out the work inform the OWNER / ARCHITECT the rates which he intends to charge for such class of work supported by analysis of the rate or rates claimed and the Engineer in Charge / ARCHITECT shall determine the rate or rates on the basis of prevailing market rates if required and pay the Contractor accordingly. However, the OWNER / ARCHITECT, by notice in writing will be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable. But under no circumstances shall the Contractor suspend the works on the plea of non-settlement of rates of extra or such item during currency of the works till virtual completion certificate issued by the OWNER / ARCHITECT. The rate for extra and substituted items shall be determined on the basis of actual cost of materials & labour etc. (for this contractor shall produce the sufficient proof) plus 15% to cover Contractor's all over-heads and profits, and works contract tax etc.

29.2 The rates of material/ labour in the extra items as forwarded by the Contractor shall be checked/verified by the OWNER / ARCHITECT.

29.3 The rates for all above items will be finally approved by the OWNER /ARCHITECT. However the Engineer- in- Charge may allow the provisional rates for such items claimed by the Contractor pending approval of final rates by the OWNER /ARCHITECT.

30 **CERTIFICATES AND PAYMENTS**

30.1 At the period of Interim Certificate named in the appendix to these conditions the ARCHITECT shall issue a certificate stating the amount due to the Contractor from the OWNER, and the Contractor shall be entitled to payment thereof within the period for honouring certificate named in the appendix to these conditions and interim valuation shall be made whenever the ARCHITECT considers them to be necessary for the purpose of ascertaining the amount to be stated as due in an interim certificate

30.2 The amount stated as due in an Interim Certificate shall subject to any agreement between the parties as to stage payments, be the total value of work properly executed and of the materials and goods delivered to or adjacent to the work for use thereon up to and including a date not more than seven days before the date of the said Certificate less any amount which may be retained by the OWNER (as provided in Sub-Clause (3) of this condition) and less any installments previously paid under this condition, provided that such certificate shall only include the value of the said materials and goods as and from such time as they are reasonably, properly and not prematurely brought to or placed adjacent to the work and then only if adequately protected against weather or other casualties.

30.3 The OWNER may retain the percentage of the total value of the work, materials and goods referred to in Sub-Clause (2) of this condition which is named in the appendix to these conditions as Security Deposit. Provided always that when the sum of the amounts so retained equals the amount named in the said appendix as limit of Security Deposit ,no further amount shall be retained by virtue of this Sub-Clause.

30.4 The amounts retained by virtue of Sub-Clause (3) of this Condition shall be subject to the following rules:-

30.4 (a) The OWNER's interest in any amounts so retained shall be fiduciary as trustee for the Contractor (but without obligation to invest), and the Contractor's beneficial interest therein shall be subject only to the right of the OWNER to have recourse thereto from time to time for payment of any amount which he is entitled under the provision of this Contract to deduct from any sum due or to become due to the Contractor.

30.5 The measurements and valuation of the work shall be completed within the period of final measurements and valuation as stated in the appendix to these Conditions, and the Contractor shall be supplied with a copy of the priced bills of variation not later than the end of the said period and before the issue of the Final Certificate under sub-clause (6) of this Condition. Either before or within a reasonable time after Virtual Completion of the work the Contractor shall send to the OWNER / ARCHITECT all documents necessary for the purpose of the computations required by these Conditions including all documents relating to the accounts of nominated sub- contractors and nominated suppliers.

30.6 As soon as is practicable but before the expiration of the period the length of which is stated in the appendix to these Conditions or from the end of the "Defects Liabilities Period" also stated in the said appendix or from completion of making good defects under Clause 39 of these conditions or from receipt by the ARCHITECT of the Document referred to Sub-Clause (5) of this condition, whichever is the latest, the ARCHITECT shall issue the Final Certificate. The Final Certificate shall state :-

30.6 (a) The sum of the amount paid to the Contractor under Interim Certificate and the amount named in the said appendix as limit of Security Deposit, and

30.6 (b) The Contract sum adjusted as necessary in accordance with the terms of these conditions, and the difference (if any) between the two sums shall be expressed in the said certificate as a balance due to the CONTRACTOR from the OWNER or to the OWNER from the CONTRACTOR as the case may be, and subject to any deductions authorized by these conditions, the said balance shall as from fourteenth day from the issue of the said certificate be a debt payable as the case may be by the OWNER to the CONTRACTOR or by the CONTRACTOR to the OWNER.

30.7 Save as afore said, certificate of the OWNER / ENGINEER IN CHARGE / ARCHITECT shall of itself be conclusive evidence that any works materials or goods to which it relates are in accordance with this Contract Documents.

31 CLAIM FOR EXTRA

31.1 When any instruction or decision given at site involve an extra or whereby the Contractor may plan to claim an extra, it shall be the responsibility of the Contractor to inform the OWNER / ARCHITECT the extra amount and get written authorization from the OWNER / ARCHITECT before proceeding with the work involved.

31.2 Any modification carried out for expanding or simplifying work at the request of the Contractor or his representatives shall not be taken as the basis for claiming an extra. However, if such modification shall also involve an extra the rate for such modification shall be settled in advance and written authorisation obtained by the CONTRACTOR from the OWNER / ENGINEER IN CHARGE / ARCHITECT before with the work involved. If no such information is given by the Contractor in writing to the OWNER / ENGINEER IN CHARGE / ARCHITECT such modification shall not be accepted as the basis for extra charge

32 DEDUCTION FOR UNCORRECTED WORK .

If the OWNER / ENGINEER IN CHARGE / ARCHITECT deems it inexpedient to correct work damaged or not done in accordance with the Contract, an equitable deduction from the contract price shall be made therefore.

33 FLUCTUATION

The rates quoted by the CONTRACTOR shall remain firm for entire period of construction including authorized extension of time. No. escalation shall be payable for this period including authorized extension of time.

34 UNFIXED GOODS AND MATERIALS

Unfixed materials and goods intended for, delivered and placed on or adjacent to the work shall not be removed except for use upon the work unless the OWNER / ARCHITECT has consented in writing to such removal which consent shall not be unreasonably with held. Where the value of any such materials or goods has in accordance with clause 30 of these conditions been included in any Interim Certificate under the Contract for which the Contractor has received payment, such materials and goods shall become the property of the OWNER, but the CONTRACTOR shall remain responsible for loss or damage to the same

35 MATERIALS AND WORKMANSHIP

All materials and workmanship shall be as per the relevant I.S .Code and of

approved quality and make and the Contractor shall immediately remove from the works any material and/or workmanship which in the opinion of the OWNER / ARCHITECT are defective or unsuitable and shall substitute proper material and or workmanship at his own cost. The term approval used in connection with this contract shall mean the approval of the OWNER / ARCHITECT .

35.1 The Contractor shall if required submit satisfactory evidence as to the kind and quality of material.

35.3 All material shall be delivered so as to ensure a speedy and uninterrupted progress of the work. Such material shall be stored so as to cause no obstruction and so as to prevent overloading of any portion of the structure, and the CONTRACTOR shall be entirely responsible for damage or loss by weather or other cause.

35.4 Within 10 days after signing the Contract, the CONTRACTOR shall submit for approval of the OWNER / ARCHITECT a complete list of all materials which he and his Sub- contractors propose to use in the work of the particular brand of any article where more than one is specified as a standard. He shall also list out items not specifically mentioned in the specifications but which are reasonably inferred necessary for the completion of the work.

35.5 **Inspection** : All materials and workmanship shall be subject to inspection, examination and test by the OWNER / ENGINEER IN CHARGE / ARCHITECT at any and all times during manufacture and / or construction. The OWNER / ENGINEER IN CHARGE / ARCHITECT shall .have the right to reject defective material and workmanship or require its correction. Rejected workmanship shall be satisfactorily replaced with proper material without additional charge therefore and CONTRACTOR shall promptly segregate and remove the rejected material from the Works. If the CONTRACTOR fails to proceed at once with the replacement of rejected materials and/or the correction of defective workmanship, the OWNER / ENGINEER IN CHARGE / ARCHITECT may by contract or otherwise replace such materials and/or correct such workmanship and charge the cost thereof to the Contractor, or may terminate the right of the CONTRACTOR to proceed further with the work.

The Contractor shall furnish promptly without additional charge all reasonable facilities, labour and materials necessary for the safe and convenient inspection and the test that may be required by the OWNER / ENGINEER IN CHARGE / ARCHITECT.

35.6 **Secured Advance on Materials:** The ENGINEER IN CHARGE / ARCHITECT in consultation of OWNER may allow in the running bills payment against non-perishable materials brought to the site of work for incorporation in the works to a maximum of 75 % of the value of materials. The Contractor on signing an indenture on proper stamp paper in the form to be specified by the ENGINEER IN CHARGE / ARCHITECT may be entitled to be paid during progress of the execution of the work a secured advance up to 75% of the estimated value of any materials which are in the opinion of the ENGINEER IN CHARGE / ARCHITECT non-perishable and are in accordance with the contract and which have been brought on the site for bonafide incorporation in the work and are protected/insured against damage by weather or other causes, but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be deducted from the next payment made under any of the clauses of the contract.

36. DEFECTS

36.1 The Contractor shall make good at his own cost and to the satisfaction of the OWNER / ENGINEER IN CHARGE / ARCHITECT, all defects, shrinkages or small faults, arising in the opinion of the OWNER / ENGINEER IN CHARGE / ARCHITECT from work or materials not being in accordance with the drawings or Specifications or Schedule of Quantities or the instructions of the OWNER / ENGINEER IN CHARGE / ARCHITECT which may appear within "Defect Liability Period" referred to in the appendix. The ARCHITECT shall visit the site during defect Liability Period to check the defects when required by the OWNER.

36.2 Such defects, shrinkage's shall upon directions in writing of the OWNER / ENGINEER IN CHARGE / ARCHITECT and within such reasonable time as shall be specified therein be amended and made good by the Contractor, at his own cost and in case of default the OWNER may employ and pay other Contractor to amend and make good such defects, shrinkage, settlements or other faults and all damages, loss and expense consequent thereon or incidental thereto shall be made good and borne by the Contractor and such damage, loss or expense shall be recoverable from him by the OWNER or may become due to. the Contractor or the OWNER may, in lieu of such amending and making good by the contractor, deduct from any money's due to the contractor a sum to be determined by the OWNER / ENGINEER IN CHARGE / ARCHITECT as equivalent to the cost of amending such work and in the event of the Security Deposit being insufficient recover the balance from the Contractor, together with any expenses the OWNER may have incurred in connection therewith.

37 **POSSESSION, COMPLETION AND POSTPONEMENT**

37.1 On the date for commencement stated in the appendix to these conditions possession of the site shall be given to the Contractor who shall there upon begin the works and regularly and diligently proceed with the same, and who will complete the same on or before the date for Completion stated in the said, appendix subject nevertheless to the provisions for extension of time contained in clause 39 of these conditions.

37.2 The OWNER / ARCHITECT may issue instructions in regard to the postponement of any work to be executed under provisions of this Contract.

38 **POSSESSION BEFORE VIRTUAL COMPLETION**

If at any time or times before Virtual Completion of the work the OWNER with the consent of the Contractor shall take possession of any part or parts of same for handing over to the Finishing Contractor or other agency, then not withstanding anything expressed or implied elsewhere in this Contract:

38.1 Such part or parts shall not be deemed to be Virtually'Complete

38.2 Virtual Completion of such part or parts would occur on the completion of the last part of the structure under this Contract

The Contractor shall not claim that such part or parts are complete and request for refund of Security Deposit in lieu thereof.

39 **EXTENSION**

Upon it becoming reasonably apparent that the progress of the work is delayed, the Contractor shall forthwith give written notice of the cause of the delay to the OWNER / ARCHITECT, and if in the opinion of the OWNER, the completion of the work is likely to be or has been delayed beyond the date for completion stated in the appendix to these conditions or beyond any extended time previously fixed under this clause.

39.1 By Force majeure. Or

39.2 By reason of any exceptionally inclement weather, or

39.3 By reason of civil commotion, local combination of workmen strike or lockout affecting any of the trades employed upon the works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materials required for the work, or

39.4 By reason of ARCHITECT's instructions issued under clauses 9,29.1,37.2 of these conditions or

39.5 By reason of the Contractor not having received in due time necessary instructions, drawings details or levels from the ARCHITECT for which he had specifically applied in writing on a date which having regard to the date for completion stated in the appendix to these conditions or to any extension of time then fixed under this clause was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for him to receive the same.

39.6 By delay on the part of artists, tradesman or others-engaged by the OWNER executing work not forming part of this Contract, or

39.7 By reason of the opening up for inspection of any work covered up or of the testing of any of the work, materials or goods in accordance with clause 35. 5 of these conditions (including making good in consequence of such opening up or testing) unless the inspection of test showed that the work, materials or goods were not in accordance with this Contract or

39.8 By reason of the Contractor's inability for reason beyond his control and which he could not reasonably have foreseen at the date of this Contract to secure such labour, goods or materials as are essential to the proper carrying of the works.

Then the OWNER / ARCHITECT shall as soon as he is able to estimate the length of the delay beyond the date or time aforesaid make in writing a fair reasonable extension of time for completion of the works. Provided always that the Contractor shall use constantly his best endeavors to prevent delay and shall do all that may reasonably be required to the satisfaction of the OWNER / ARCHITECT to proceed with the work.

40. DAMAGE FOR NON-COMPLETION

If the Contractor fails to complete the works by the date specified in these conditions or within any extended time fixed under clause 39 of these conditions and the ENGINEER IN CHARGE / ARCHITECT certifies in writing that in his opinion the same ought reasonably to have been completed, the Contractor shall pay or allow to the OWNER a sum calculated at the rate stated in the appendix as agreed Liquidated Damages for the period during which the said work shall so remain or have remained incomplete, the OWNER may deduct such damages from any monies otherwise payable to the Contractor under this Contract.

After a period of two weeks ,the Contract will come to an end and the owner shall be at liberty to withdraw the work and get it executed from any other agency at Contractor risk and cost and the site shall be vacated by Contractor immediately.

41. V1IRTUAL COMPLETION AND DEFECTS LIABILITY PERIOD

41.1 When in the opinion of the OWNER / ENGINEER IN CHARGE / ARCHITECT the works are practically completed, he shall forthwith issue a certificate to that effect and Virtual Completion of the works shall be deemed for all the purpose of this Contract to have taken place on the day named in such certificate.

41.2 Any defects, shrinkage or other faults which shall appear within the "Defects Liability Period" stated in the appendix to these conditions and which are due to materials and workmanship not in accordance with this Contract shall be specified by the OWNER / ARCHITECT in a Schedule of Defects which he shall deliver to the Contractor not later than 14 days after the expiration of the said Defects Liability Period and within a reasonable time after receipt of such schedule the Defects, Shrinkage's and other faults therein specified shall be made good by the Contractor and (unless the OWNER shall otherwise instruct in which case the contract sum shall be adjusted accordingly) entirely at his own cost.

41.3 Notwithstanding sub-clause (2) of this condition the OWNER / ARCHITECT may whenever he considers it necessary to do so, issue instructions requiring any defects, shrinkages or other fault which shall appear within the Defects Liability Period named in the appendix to these conditions and which are due to materials and workmanship not in accordance with this contract to be made good and the Contractor shall within a reasonable time after receipt of such instructions comply with the same entirely at his own cost, provided that no such instruction shall be issued after 14 days from the expiration of the said defects liability period.

41.4 When in the opinion of the OWNER / ARCHITECT any defects, shrinkages or other defaults which he may have required to be made good under sub-clause (2) and (3) of this condition shall have been made good he shall issue a certificate to that effect and completion of making good defects shall be deemed for all the purposes of this contract to have taken place on the day named in such certificates.

42. PAYMENT WITH HELD

The OWNER / ARCHITECT may withhold or on account of a subsequently discovered evidence nullify the whole or part of any certificate to such extent as may be necessary in his reasonable opinion to protect the OWNER from loss on account of:

42.1 Defective work not remedied.

42.2 Failure of the Contractor to make payments properly to Sub-Contractor or for materials or labour.

42.3 Damage to another Contractor or Sub-contractor

42.4 Claims filed on reasonable evidence indicating probable filing of claims.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

43. INJURY TO PERSONS AND PROPERTY OWNER

43.1 The Contractor shall be liable for and shall indemnify the OWNER against any liability, loss, claim or proceedings whatsoever arising under any statute or at common law in respect of personal injury to or the death of any person whomsoever arising out of or in the course of or caused by the carrying out of the works, unless due to any act or neglect of the OWNER or of any person for whom the OWNER is responsible.

43.2 Except for such loss or damage as at the risk of the OWNER under clause 45 of these conditions (if applicable) -the Contractor shall be liable for and shall indemnify the OWNER against any expense, liability, loss, claim or proceedings in respect of any injury or damage whatsoever to any property real or personal in so far as such injury or damage arises out of or in the course of or by reason of the carrying out of the works, and provided always that the same is due to any negligence omission or default of the Contractor, his servants or agents or of any Sub-Contractor, his servants or agents.

44. INSURANCE AGAINST INJURY TO PERSONS AND PROPERTY

44.1 Without prejudice to his liability to indemnify the OWNER under clause 43 of these conditions the Contractor shall maintain and shall cause any Sub-Contractor to maintain.

44.1 a. Such insurance as are necessary to cover the liability of the Contractor or as the case may be of Sub-Contractor in respect of personal injuries or deaths arising out of or in the course of or caused by the carrying out of the work and

44.1 b Such insurance as may be specifically required by the Contractor in respect of injury or damage to property real or personal arising out of or in the course of or by reason of the carrying out of the work, and caused by any negligence, omission or default of the' Contractor, his servants or agents or, as the case may be of such sub-contractor, his servants or agents. The Contractor shall produce or cause any Sub-Contractor to produce for inspection the relevant policy or policies of insurance together with the receipts in respect of premiums paid under such policy or policies as and when required to do so by the ARCHITECT provided always that as and when may be reasonably required by the OWNER the production by either the Contractor or any sub-Contractor of a current certificate of insurance from the company or Firm which shall have issued the policy or policies aforesaid shall be a good discharge of the Contractor's obligation to produce or to cause the production of the policy/policies and the receipts in respect of premium paid.

44.2 a The Contractor shall maintain in the joint names of the OWNER and Contractor such insurance as may be required in respect of any expense, liability , loss, claim or proceedings which the OWNER may incur or sustain by reason of injury or damage to property real or personal arising out of or in the course of or by reason of the carrying

out the work, and caused otherwise than by the negligence, omission or default of the Contractor, his servants or agents or any sub- Contractor, his servants or agents .

44.2 b. Any such insurance as is referred to in the immediately preceding paragraph shall be placed with insurers to be approved by the OWNER / ARCHITECT and the CONTRACTOR shall have to deposit with him the policy or policies and the receipt in respect of premiums paid.

44.3 Should the Contractor or any sub-Contractor make default in insuring or in continuing to insure as provided in sub-clause (1) and (2) of this condition the OWNER may himself insure against any risk with respect to which the default shall have occurred and may deduct a sum equivalent to the amount paid in respect of premiums from any monies due to or become due to the Contractor.

45. INSURANCE OF THE WORKS AGAINST FIRE, ETC.

45.1 a. The Contractor shall in the joint names of the OWNER and Contractor insure against loss or damage by fire, storm, tempest, lightning, flood, earthquake, aircraft or anything dropped therefrom, aerial objects, riot and civil commotion for the full value thereof, all work executed and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the work, but excluding temporary building plant, tools and equipment owned or hired by the Contractor or any Sub-Contractor and shall keep such work materials and goods so insured until Virtual Completion of the work. Such insurance shall be approved by the OWNER / ARCHITECT and the Contractor shall deposit with the OWNER / ARCHITECT the policy or policies and the receipts in respect of premiums paid and should the Contractor make default in insuring or continuing to insure as aforesaid the OWNER may himself insure against any risk with respect of which the default shall have occurred and deduct a sum equivalent to the amount paid by him in respect of premium from any monies due to or to become due to the Contractor Provided always that if the Contractor shall independently of his obligations under this contract maintain a policy of insurance which covers (inter alia) the said work, materials and goods against the aforesaid contingencies to the full value thereof, then the maintenance by the Contractor of such policy shall if the Owner's interest is endorsed thereon, be a discharge of the CONTRACTOR'S obligation to insure in the joint names of the OWNER and Contractor and the production by the Contractor as and when may reasonably be required by the OWNER / ARCHITECT of a current certificate of insurance from the company or firm which shall have issued the said policy shall be a discharge of the Contractor's obligation to deposit with the OWNER / ARCHITECT a policy or policies and the receipts in respect of premiums paid.

45.1 b. Upon settlement of any claim under the insurance aforesaid, the Contractor with due diligence shall restore work damage, replace or repair unfixed materials or goods which have been destroyed or injured, remove or dispose of any debris and proceed with the carrying out and completion of the work. All monies received from such insurance shall be paid to the Contractor by installment under certificates of the ARCHITECT issued at the period of interim certificates named in the appendix to these conditions. The Contractor shall not be entitled to payment in respect of the restoration

of work damaged, the replacement and repair of any unfixed materials or goods and the removal and disposal of debris other than the monies received under the said insurance.

45.2 All work executed and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the work (except temporary buildings, plant, tools and equipment owned or hired by the Contractor: or any Sub-Contractor) shall be at the sole risk of the Contractor as regards loss or damage by fire, storm, tempest, lightning, flood, earthquake, aircraft or anything dropped therefrom, aerial objects, riot and civil commotion. If any loss or damage affecting the work or any part thereof or such unfixed materials or goods is occasioned by anyone or more of the said contingencies, then:

45.2 (a) The occurrence of such loss or damage shall be disregarded in computing any amounts payable to the Contractor under or by virtue of this contract. .

45.2 (b) The Contractor with due diligence shall restore work damage, replace or repair any unfixed materials or goods which have been destroyed or injured, remove and dispose off any debris and proceed with carrying out and completion of the work. The restoration of work damaged, the replacement and repair of unfixed material and goods and the removal and disposal of debris shall be done by the Contractor at his cost.

45.3 If the Contractor fails to take insurance of the work against fire etc. the OWNER can take such insurance at the cost of the Contractor or recover from the Contractor the premium that he would have paid for such insurance.

45.4 All insurance policies shall be valid upto the Date of expiry of Defect Liability Period.

46. DETERMINATION BY OWNER

46.1 Default: If the Contractor makes default in anyone or more of the following respects, that is to say:

46.1 (a) If he without reasonable cause suspends the carrying out of the works before completion thereof, or

46.1 b If he fails to proceed regularly and diligently with the works or

46.1 c If he refuses or persistently neglects to comply with a written notice from the OWNER / ARCHITECT requiring him to remove defective work or improper materials or goods and by such refusal or neglect the work is materially affected, then the OWNER / ARCHITECT may give him the notice by registered post or recorded delivery specifying the default, and if the Contractor either continues such a default for 14 days after receipt of such a notice and shall at any time thereafter repeat such a default (whether previously repeated or not) then the OWNER without prejudice to any other rights or remedies may within 10 days after such continuance or repetition of notice by

registered post or recorded delivery forthwith determine the employment of the Contractor under this Contract.

46.2 Bankruptcy of Contractor: In the event of the Contractor becoming bankrupt or making a composition or arrangement with his creditors or being a company having a winding up order made or (except for purposes of reconstruction) a resolution for voluntary winding up passed or a receiver or manager of his business or undertaking duly appointed or possession taken by or on behalf of the holders of any debentures secured by a floating charge, of any property comprised in or subject to the floating charge, the employment of the Contractor under this Contract shall be forthwith automatically determined but the said employment may be reinstated and continued if the OWNER and the Contractor, his trustee in bankruptcy liquidate, receiver or manager as the case may be shall so agree.

46.3. The OWNER shall be entitled to determine the employment of the Contractor under this Contract if the Contractor has offered or given or agreed to give to any person any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any action in relation to the obtaining or execution of this contract with the OWNER, or for showing or forbearing to show favour or disfavour to any person in relation to this Contract or any other Contract with OWNER, or if the like acts have been done by any person employed by the Contractor or acting on his behalf (whether with or without the knowledge of the Contractor), or if in relation to this Contract or any other Contract with the OWNER, the Contractor or any person employed by him or acting on his behalf has committed any offence under the prevention of corruption act, or has given any fee or reward, the receipt of which is an offence under the Local Government Act.

46.4. In the event of the employment of the Contractor being determined as aforesaid and so long as it has not been reinstated and continued, the following shall be the respective rights and duties of the OWNER and Contractor.

46.4 a. The OWNER may employ and pay other persons to carry out and complete the works and' he or they may enter upon the works and use all temporary buildings, plant, machinery , appliances, goods and materials intended for, delivered to and placed on or adjacent to the works and may purchase all materials and goods necessary for the carrying out and completion of the works.

46.4 b The Contractor shall if so required by the OWNER within 14 days of the date of determination assign to the OWNER without payment the benefit of any Agreement for the supply of materials or goods and or for the execution of any works for the purposes of this Contract but on the terms that a supplier or Sub-Contractor shall not be entitled to make any reasonable objection any further assignment thereof by the OWNER.

46.4 c The Contractor shall as and when required in writing by the OWNER / ARCHITECT to do so (but not before) remove from the works any temporary buildings, plant, tool, equipments, goods and materials belonging to or hired by him. If within a reasonable time after any such requirements has been made, the Contractor has not complied

therewith, then the OWNER may (but without being responsible for any loss or damage) remove and sell any such property of the Contractor, holding the proceeds less all costs incurred to the credit of the Contractor.

46.4 d The Contractor shall allow or pay to the OWNER in the manner hereinafter appearing the amount of any direct loss and/or damage caused to the OWNER by the determination. Until after completion of the works under paragraph (a) of this Sub-Clause the OWNER shall not be bound by any provisions of this Contract to make any further payment to the Contractor, but upon such completion and the verification within a reasonable time of the accounts therefore the ARCHITECT shall certify the amount of expense properly incurred by the OWNER and the amount of any direct loss and/or damage caused to the OWNER by the determination and if such amount when added to the monies paid to the Contractor before the date of determination exceed the total amount which would have been payable on due completion in accordance with this Contract, the difference shall be a debt payable to the OWNER by the Contractor, and if the said amounts, when added to the said monies be less than the said total amounts, the difference shall be a debt payable by the OWNER to the Contractor.

47. CO-ORDINATION OF WORK

At the commencement of work, and from time to time, the Contractor shall conferm with the Sub-contractors, persons engaged on separate contracts in connection with the work, and with the OWNER / ARCHITECT for the purpose of the co-ordination and execution of the various phases of the work. The Contractor shall ascertain the Sub-contractors, persons engaged on separate contracts in connection with the works, the extent of all chasing, cuttings and forming of all openings, holes, grooves, etc. as may be required to accommodate the various services, the Contractor shall ascertain the routes of all services, and the positions of all Light Points, Junctions Boxes etc. in connection with the installation of plant and services and arrange for the Construction of work accordingly. The breaking and cutting of completed work must be avoided.

48. LABOUR

The Contractor shall employ no child labour under 14 years of age on the work. If female labours engaged, the Contractor shall make necessary provision for safeguarding small children and keeping them clear of the site of operations. No labourer shall reside within the compound except authorised guards.

a) The contractor shall, at all time during the continuance of the contract, comply full with existing Acts, regulations and byelaws including all statutory amendment and re-enactment of State or Central Government and other local authorities and any other enactments, notification and acts that may be passed in future either by the State or the Central Government or local authority including Indian Workmen's compensation Act. Contract Labour (Regulation and Abolition) Act 1970 and Equal Remuneration Act 1976. Factories Act, Minimum Wages Act, Provident Fund Regulations. Employees Provident Fund Act, Schemes made under the same Act. Health and Sanitary Arrangement for workmen, Insurance and other benefits and

shall keep Employer indemnified in case any action is commenced by competent authorities for contravention by the Contractor. If the Owner is caused to pay or reimburse, such amounts as may be necessary to cause or observe ,or for non-observance of the provisions stipulated here forth on the part of the Contractor , the Owner shall have the right to deduct from any moneys due to the Contractor, his amount of Security or recover from the Contractor personally any sum required for estimated to be required for making good the loss or damage suffered by the Owner provided , however , the Owner shall have no other responsibility in connection with the employees of the contractor, who shall, in no case, be treated as the employees of the owner at any point of time.

b) The Contractor shall pay the labourers engaged by him on the work not less than a fair wage, which expression shall mean, whether for time or piecework, the respective rates of wages fixed by Local Government as fair wages for the area payable to the different categories of labourers or those notified under the Minimum Wages Act for corresponding employees of the owner, whichever may be higher.

c) The Contractor shall, notwithstanding the provisions of a contract to the contractory, cause to be paid a fair wage to labourers indirectly engaged on the works, including any labour engaged on the works, including & labour engaged by sub-contractors in connection with the said works as if the labourer had been directly employed by him.

49. PROTECTION OF TREES AND SHRUBS

Trees and Shrubs designated by the OWNER / ARCHITECT shall be protected from damage during the course of the work and the earth level shall not be changed within three feet of such tree. Where necessary such trees and shrubs shall be protected by means of temporary fencing.

50. GUARANTEE

50.1 Besides guarantees required elsewhere, the Contractor shall guarantee the work in general for one year as noted under clause of the Conditions.

50.2 All required guarantees shall be submitted to the OWNER /ENGINEER-IN-CHARGE by the Contractor when requesting certification of accounts for payment by the OWNER.

51. ANTIQUES

51.1 All fossils, antiques, and other objects of interest or value which may be found on the site or in excavating the same during the progress of the work shall become the property of the OWNER.

The Contractor shall carefully take out and preserve all such objects and shall immediately or as soon as conveniently may be after the discovery of such articles deliver

the same into the possession of the OWNER / ENGINEER IN CHARGE / ARCHITECT un cleaned and as excavated.

51 If in the opinion of the OWNER / ARCHITECT compliance with the provisions of the preceding Sub-Clause has involved the Contractor in direct loss and/or expense for which he would not be reimbursed by a payment made under any other provision in this Contract, then the OWNER / ARCHITECT shall ascertain the amount of such loss and/or expense, any amount from time to time so ascertained shall be added to the Contract sum, and if an Interim Certificate is issued after the date of ascertainment any such amounts shall be added to the amount which would otherwise be stated as due in such certificates.

52. **EXCEPTIONAL MATTERS**

The decision, opinion, direction, certificate (except for payment) with respect to all or any of the matters under clauses 5,9,19,25,26,35,43 & 46 hereof (which matters are herein referred to as the excepted matters) shall be final and conclusive and binding on the parties hereto and shall be without appeal. Any other decision, opinion, direction, certificate or valuation of the Architect or, any refusal of the Architect to give any of the same shall be subject to any right of Arbitration and review in the same way in all respect (including the provision as to opening the reference) as if it were a decision of the Architect under the following clause.

53. ARB ITRATION

All dispute and differences of any kind whatever arising out of or in connection with the Contract or the carrying out of the works (whether during the progress of the works or after their completion and whether before or after the determination, abandonment or breach of the Contract) shall be referred to and settled by the Engineer in Charge / Architect who shall state his decision in writing. Such decision may be in the form of a Final Certificate or otherwise. The decision of the Engineer in Charge / Architect with respect of any of the excepted matters shall be final and without appeal. But if either the Owner or the Contractor be dissatisfied with the decision of the Architect on any matter, question or dispute of any kind(except any of the excepted matters) or as to the with holding by title Architect of any certificate to which the Contractor may claim to be entitled then and in any such case either party (the Owner or the Contractor) may with 28 days after receiving notice of such decision give a written notice to the other party through the architect requiring that such matters in dispute be" Arbitraced upon. Such written note shall specify the matters which are in dispute together with the amount or amount claimed in respect of such dispute or difference of which such written notice has been given and no other shall be and is hereby referred to the Arbitration and final decision of a single Arbitrator being a Qualified Engineer/ Architect to be agreed upon and appointed by both the parties or in case of disagreement as to the appointment of a single Arbitrators to the Arbitration then the Arbitrations of

two Arbitrators both being a Qualified Engineer/ Architect one to be appointed by each party,which Arbitrators shall before taking upon themselves the burden of reference appoint an Umpire.

The Arbitrator, the Arbitrators or the Umpire as the case may be shall have power to open up review and revise any certificate , opinion,decision, requisition or notice save in regard to the excepted matters referred to in clause 52 determine all matters in dispute which shall be submitted to him or them and of which notice shall have been given as aforesaid.

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications designs, drawings and instructions herein before mentioned and as to the quality or workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works, or the execution or failure to execute the same whether arising during the progress of the work or after the completion of, abandonment thereof shall be referred to the sole arbitration of the person appointed by the OWNER.

The Arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason then The Owner at the time of such transfer, vacation of office or inability to act, shall appoint another person to act as Arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which his predecessor left it.

Subject as aforesaid the provisions of the latest Arbitration and conciliation Act or any statutory modification or re- enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause. It is also a term of the contract that the party invoking arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute.

It is also a term of the contract that if the Contractor(s) do/does not make any demand for arbitration in respect of any claim (s) in writing within 90 days of receiving the intimation from the OWNER that the final bill is ready for payment the claim of the Contractor (s) will be deemed to have been waived and absolutely barred and The Owner shall be discharged and released of all liabilities under the contract in respect of these claims. The Arbitrator shall give a reasoned award if the amount of award is more than Rs. 50,000/-

54. PROTECTION AND CLEANING

54.1 The Contractor shall protect and preserve the work from all damages or accidents by providing necessary protections/temporary works etc. or other constructions as required by the OWNER / ARCHITECT This protection shall be provided for all property adjacent to the site as well as on the site.

54.2 The Contractor shall properly clean the work as it progresses and shall remove all rubbish and debris from the site from time to time as is necessary and as directed. On completion the Contractor shall ensure that the premises and/or site are cleaned of surplus materials debris, shed etc. areas under floors cleared of rubbish, gutters and drains cleaned, doors and windows and sashes eased, locks and fastenings oiled, keys clearly labeled and handed over to the OWNER so that the whole work is left fit for immediate occupation or use and to the satisfaction of the OWNER / ARCHITECT

55. TOLERANCE

The Contractor shall exercise every care to ensure that all structural members are sufficiently plumb and true to dimensions called for on the drawings to receive finishing elements such as concrete copings, railings, gates, claddings, washed grit finishes etc. Any variations may require rectification in the structural members or may involve remaking or replacing the finishing elements, fabricated to fit into the openings or spaces, as called for on the Drawings.

In case of separate Contract, the Contractor whose work does not conform to dimensions called for, shall be liable for all the expenses which may have to be incurred for rectification or replacement as may be required by the OWNER / ARCHITECT for the proper installation of the finishing elements. The ARCHITECT decision in this respect shall be final and binding on the parties concerned.

7.00 OTHER SPECIAL CONDITIONS OF CONTRACT

1. The entire work shall be carried out as per latest CPWD Specifications (with up to date correction slips)

However, in case of any discrepancy in the description of any items as given in the Schedule of Quantities appended with the tender and the specification relating to the relevant item as per latest CPWD specifications , the former shall prevail. If the specifications for any items are not available in the CPWD specifications referred above, relevant I.S.I. specifications shall be followed. In case I.S.I. specifications are also not available the decision of the OWNER / ARCHITECT shall be final.

Wherever any reference to any Indian standard Specifications occurs in the document referring to this contract, the same shall be inclusive of all the amendments issued thereto or revisions there of, if any, upto the date of receipt of tenders.

2 Samples of all materials required for execution of the work shall be got approved from the OWNER / ARCHITECT. Articles manufactured by firms of repute and approved by the OWNER / ARCHITECT shall only be used. Articles classified as first quality by the manufacturer shall be used unless otherwise specified.

Preference shall be given to those articles which bear ISI certification mark. In case articles bearing ISI certification mark are not available the quality of samples brought by the Contractor shall be judged by the standards laid down in the relevant ISI specifications. All materials and articles brought by the Contractor to the site for use shall conform to the sample approved which shall be preserved till the completion of the work.

3 The work shall be carried out in the manner complying in all respects with requirements of relevant bye laws of the local body under the jurisdiction of which the work is to be executed as directed by the OWNER / ARCHITECT and nothing extra shall be paid on this account.

4. The work will be carried out in accordance with the ARCHITECT/CONSULTANT drawings. The structural and Architectural drawings shall at all times have to be properly co-related before executing the work . OWNER / ARCHITECT's requirement shall have to be fully satisfied. For finishing items samples shall be prepared for prior approval of the OWNER / ARCHITECT before starting the particular items of work.

5 The Contractor shall carry out necessary performance tests for the entire installations as per standard specifications before the work is finally accepted and nothing whatsoever shall be payable to the Contractor without such tests.

6. The Contractor shall carry out all tests required and pay all charges in connection therewith including fee for testing as may be specified to be conducted by an approved testing authority by the OWNER / ARCHITECT. Unless otherwise specified. In all such cases cost of samples and to and for carriage shall be borne by the Contractor. Nothing extra shall be payable to the Contractor on account of above testing charges. .

7 The ENGINEER-IN-CHARGE/Contractor should maintain the Register for material etc. and other Registers required by the OWNER / ARCHITECT and these should be signed by the Contractor or his authorised agent and the ENGINEER-IN-CHARGE of the work

8 The CONTRACTOR shall be responsible to arrange at his own cost all necessary tools and plants required for the execution of work.

9. The CONTRACTOR shall provide suitable weighing, measuring and leveling arrangement at site for checking the weight, dimensions, and levels as may be necessary for execution of work.

10. The CONTRACTOR shall have such openings etc. as may be required for the electric and nothing extra shall be paid on this account.

11 The work of electrification, horticulture and other internal and external services may be carried out simultaneously by other agencies. The CONTRACTOR shall afford necessary facilities for the same. No claim in the matter shall be entertained and nothing extra over the agreement rates shall be paid for fixing, laying/burying in the work pipes, cables, conduits, clamps, Junction boxes, etc.

12. The rates for items of work included in the Schedule of Quantities shall be applicable for all floors except for items where specified otherwise.

13 Contractor will submit the running bills on the basis of clear measurements recorded in a "Measurement Book" (herein referred to as MB and enclosed with the running bill), in quadruplicate with one copy to the OWNER, two copies to Engineer –in- Charge and one copy to ARCHITECT. ARCHITECT would assess the quality of workmanship for which measurement have been recorded, adherence to specifications / instructions, verify the measurement as recorded in the MB and certify the amount payable. OWNER may also cross verify the measurement preferably jointly with ENGINEER IN CHARGE / ARCHITECT if feasible or otherwise independently.
Under special circumstances ENGINEER IN CHARGE / ARCHITECT may recommend payment on account of up to 75% of the submitted bill payable before measurement verification, subject to approval of the OWNER.

14 The Contractor shall furnish the code number allotted by EPFO (Employee Provident Fund Organisation) authority to the college and maintain proper documents of the man power engaged permanently and submit to the institute quarterly for verification.

15 Contractor shall follow all the relevant laws including labour / provident fund / ESI / local authorities as applicable in the state or notified from time to time and will be responsible for any liability accrued on this account and keep the Owner indemnified of any liability, whatsoever in connection with the execution of this work.
The contractor shall furnish the code number allotted by EPFO authority to the college and maintain proper documents of the man power engaged permanently and submit to the college quarterly for verification.

16 Work Contract Tax and T.D.S etc as applicable shall be deducted from Contractors bill.

17 Necessary insurance of labour under Workman Compensation Act and the building including any injuries to labour or damage to building on any account shall be got done by Contractor and the copy of the same sent to OWNER

18 Contractor shall make his own arrangement for storage of water and electricity for the construction at his own cost and the generator of suitable capacity to finish the job in time.

19 Quantities of items are approximate and liable to change to any extent on either side . Any variation in quantities shall not vitiate the contract.

20 Contractor shall not sub let the work to any other Contractor or Agency without written approval of the architect.

21 The owner has right to withdraw any item of work from the contract or add / delete or change the same. Contractor shall make no extra claim for the same.

22 The work shall be completed within the time as per appendix to General Condition of Contract Timely completion is essence of this order and Contractor shall pay liquidated damages @ as per appendix to General Condition of Contract.

After a period of two weeks, the contract will come to end and the owner shall be at liberty to withdraw the work and get it executed from any other agency at Contractor risk and cost and the site shall be vacated by Contractor immediately.

23 No escalation in prices shall be allowed as this is a short term contract.

24 No Mobilization Advance will be paid .

25 Minimum amount of Running bill would be as per appendix to General Condition of Contract.

26 Tender should be unconditioned as conditional tenders are liable to be rejected.

27 In addition to mandatory tests as specified the Contractor will get tests conducted on other materials as per instructions of the Owner / Architect. The cost of all these tests shall be borne by the Contractor.

28 Engineer – in – Charge will work under the instructions of OWNER / ARCHTIECT.

The contractor shall be responsible to obtain all approval, if required. All Govt charges shall however to be reimbursed to Contractor on production of original deposit receipts.

SPECIAL CONDITIONS OF CONTRACT- ELECTRICAL SYSTEM

1. This contract is a refurbishing work in which existing conduits and wiring works need to be dismantled and handed over to the client, wherever directed by the engineer in charge. The existing modular plate fittings and light fittings will be removed and stored while the fresh conduiting and wiring work will be carried out and then they will be re-installed. The contractor will be deemed to have visited the site and ascertained the situation before formally submitting an offer.

2. All electrical works will be carried out as per 'GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS, PART-1, INTERNAL, 2005'- CPWD publication.

3. All non-metallic conduit pipes and accessories shall be of suitable materials complying with IS: 2509-1973 and IS:3419-1989 for rigid conduits and IS:9537 (part 5) 2000 for flexible conduits.

4. No non-metallic conduits less than 20 mm in diameter shall be used.

5. The maximum number of PVC insulated copper conductor cables of 650/1100 V grade conforming to IS: 694-1990 that can be drawn in one conduit of various sizes is given in the **Table 1** attached along with this document. Conduit sizes shall be selected accordingly.

6. A protective earth conductor shall be drawn inside all conduits in all distribution circuits to provide for earthing of non-current carrying metallic parts of the installation. These shall be terminated on the earth terminal in the switch boxes, and/or earth terminal blocks at the DB's.

7. Gas or water pipe shall not be used as protective conductors.

8. No existing conduit or wiring material will be reused as part of the new works.

TABLE 1- MAXIMUM NUMBER OF PVC INSULATED 650/1100 V GRADE ALUMINIUM/ COPPER CONDUCTOR CABLE CONFORMING TO IS: 694 1990

NOMINAL CROSS SECTIONAL AREA OF CONDUCTOR IN SQ.MM	20 MM		25 MM		32 MM		38 MM		51 MM		64 MM	
	S	B	S	B	S	B	S	B	S	B	S	B
1	2	3	4	5	6	7	8	9	10	11	12	13
1.5	5	4	10	8	18	12	-	-	-	-	-	-
2.5	5	3	8	6	12	10	-	-	-	-	-	-
4	3	2	6	5	10	8	-	-	-	-	-	-
6	2	-	5	4	8	7	-	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25	-	-	-	-	3	2	5	3	8	6	9	7
35	-	-	-	-	-	-	3	2	6	5	8	6
50	-	-	-	-	-	-	-	-	5	3	6	5
70	-	-	-	-	-	-	-	-	4	3	5	4

NOTE:

1) THE ABOVE TABLE SHOWS THE MAXIMUM CAPACITY OF CONDUITS FOR A SIMULTANEOUS DRAWING IN OF CABLES.
2) THE COLUMNS HEADED 'S' APPLY TO RUNS OF CONDUITS WHICH HAVE DISTANCE NOT EXCEEDING 4.25 M BETWEEN DRAW IN BOXES AND WHICH DO NOT DEFLECT FROM THE STRAIGHT BY AN ANGLE OF MORE THAN 15 DEGREES. THE COLUMN HEADED B' APPLY TO RUNS OF CONDUIT, WHICH DEFLECT FROM THE STRAIGHT BY AN ANGLE OF MORE THAN 15 DEGREES.
3) CONDUIT SIZES ARE THE NOMINAL EXTERNAL DIAMETERS.

LIST OF CONTENTS

A) GENERAL SPECIFICATIONS

1.0 Drawings:

The work shall be carried out in accordance with the drawings enclosed with the tender documents and also in accordance with modification thereto from time to time as approved by
the Owner / Consultant/ Project Manager.

2.0 Conformity to IE Act, IE Rules and Standards:

All Electrical works shall be carried out in accordance with the provisions of Indian Electricity
Act, 1910 and Indian Electricity Rules, 1956 amended up to date (Date of call of tender unless specified otherwise).

3.0 Quality of Materials:

All materials and equipments supplied by the contractor shall be new. They shall be of suchdesign, size and materials as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site.

4.0 Inspection of Materials and Equipments:

a) Materials and equipments to be used in the work shall be inspected by the Owner /
Consultant/ Project Manager. Such inspection will be of following categories:

i) Inspection of materials/equipments to be witnessed at the Manufacturer's premises in accordance with relevant BIS/ Agreement Inspection Procedure.

ii) To receive materials at site with Manufacturer's Test Certificate(s).

iii) To inspect materials at the Authorized Dealer's Godowns to ensure delivery of genuine materials at site. .

iv) To receive materials after physical inspection at site.

b) The Consultant /Project Manager will take adequate care to ensure that only tested and genuine materials of proper quality are used in work.

c) Similarly, for fabricated equipments, the contractor will first submit dimensional

detailed drawings for approval before fabrication is taken up in the factory. Suitable stage inspection at factory also will be made to ensure proper use of materials, workmanship and quality control.

d) The tender specifications will stipulate the Inspection requirements or their waiver for various materials/equipments including norms of inspection in specific cases.

5.0 Ratings of Components:

a) All components in a wiring installation shall be of appropriate ratings of voltage, current, and frequency, as required at the respective sections of the electrical installation in which they are used. .

b) All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current, which will normally flow through them, without their respective ratings being exceeded.

6.0 Conformity to Standards:

a) All components shall conform to relevant Indian Standard Specifications, wherever existing. Materials with ISI certification mark shall be preferred.

7.0 Interchangeability:

Similar parts of all switches, lamp holders, distribution boards, switch gears, ceiling roses, brackets, pendants, fans and all-other fittings of the same type shall be interchangeable in each installation.

8.0 WORKMANSHIP:

Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall conform to sound engineering practice.

9.0 Proper Supervision/Skilled Workmen:

The contractor shall be a licensed electrical contractor of appropriate class suitable for execution of the electrical work. He shall engage suitably skilled/licensed workmen of various categories for execution of work supervised by supervisors / Engineer of appropriate qualification and experience to ensure proper execution of work. They will carry out instructions of Owner / Consultant/ Project Manager during the progress of work.

10.0 Use of quality materials:

Only quality materials of reputed make as specified in the Approved List of Makes will be used
in work. Any other item to be used but not specified in the list shall be approved by Client/Consultants.

11.0 Fabrication in Reputed Workshop:

Switch boards and LT panels shall be fabricated in a factory/workshop having modern facilities like quality fabrication, seven tank process, powder/epoxy paint plant, proper testing facilities, manned by qualified technical personnel.

The tender shall specify some quality makes of fabricators with modern facilities of design, fabrication and testing capable of delivering high quality LT panels and switch boards after testing as per relevant specifications.

12.0 TESTING:

All tests prescribed in these General Specifications, to be done before, during and after installation, shall be carried out, and the test results shall be submitted to the Project Manager in prescribed Performa, forming part of the Completion Certificate.

13.0 COMMISSIONING ON COMPLETION:

After the work is completed, it shall be ensured that the installation is tested and commissioned.

14.0 GUARANTEE

The installation will be handed over to the Client after necessary testing and commissioning. The installation will be guaranteed against any defective workmanship. Similarly, the materials supplied by the contractor will be guaranteed against any manufacturing defect, inferior quality.

B) WIRING

1 GENERAL

Technical Specifications in this section cover the Internal Wiring Installations comprising of :

- Wiring for lights and convenience socket outlets etc. in concealed/surface conduit/raceways.
- Wiring for telephone outlets.
- Su main wiring.
- Conduiting for Low Voltage System

2 STANDARDS AND CODES

Latest upto date Indian Standard (IS) and Code of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and / or IEC Standard shall be applicable.

3 CONDUITS

3.1 Steel Conduits

These shall be of mild steel 16 gauge upto 32mm and 14 gauge for sizes above 32mm, electric resistance welded (ERW), electric threaded type having perfectly circular tubing. Conduits shall be precession welded ERW and shall be fabricated from tested steel strips ofthickness as per IS by high frequency induction weld process. Weld shall be smooth and of consistent of high quality to ensure crack proof bending. The conduits shall be black enamel painted inside and outside in its manufactured form. Wherever so specified, the conduit shall be galvanized. All conduits used in this work shall be ISI embossed.

3.2 MS Conduits

The electrical wiring shall be done in recessed MS Conduits, unless mentioned otherwise. No conduit less than 25 mm in diameter shall be used, unless otherwise specifically ask by Consultant / Project Manager.

3.3 PVC Conduits (if required)

Wiring shall be carried out in recessed /surface PVC conduits. The PVC conduits conform to latest and shall be ISI embossed. The conduits shall be heavy gauge (minimum 2 mm wall thickness) and the interiors of the conduits shall be free from all obstructions. All joints in conduits shall be sealed/cemented with approved solvent cement. Damage conduits/fittings not be used. Cut ends of conduits shall not have sharp edges.

3.4 Bends

As far as possible, the conduit system shall be so laid out that it shall obviate use of tees, elbows and sharp bends. No length of conduit shall have more than the equivalent of two quarter bends from inlet to outlet.

3.5 Conduit Accessories.

3.5.1 Standard accessories

The conduit wiring system shall be complete in all respects, including their accessories. Bends, couplers etc. shall be solid type in recessed type of works and may be solid or inspection type as required, in surface type of works. The accessories shall conform in all respects to the relevant IS. Samples shall be got approved by Consultant / Project Manager before use.

3.5.2 Fabricated accessories

Wherever required, outlet/junction boxes of required sizes shall be fabricated from 1.6 mm thick MS sheets excepting ceiling fan outlet boxes which shall be fabricated from minimum 3 mm thick sheets. The outlet boxes shall be of approved quality, finish and manufacture. Suitable means of fixing connectors etc., if required, shall be provided in the boxes. The boxes shall be protected from rust by zinc phosphate primer process. Boxes shall be finished with minimum 2 coats of enamel paint of approved colour. A screwed brass stud shall be provided in all boxes as earthing terminal.

4. WIRES

Wiring shall be carried out with PVC insulated 660/1100 volt grade unsheathed single core wires with electrolytic annealed stranded copper (unless otherwise stated) conductors conforming to latest IS Code. All wire rolls shall be ISI marked. All wires shall bear manufacturer's label and shall be brought to site in new and original packages. Manufacturer's certificate, certifying that wires brought to site are of their manufacture shall be furnished as required.

5 COAXIAL CABLES

The coaxial cables shall be of videband type with operation up to 300 MHz capability. Aging resistance shall comply with latest code i.e. maximum 5% increase in attenuation at 200 MHz measured by artificial aging (14 days at 80o C) cables shall meet all exceed following specifications

Center core Dia	**0.8 mm**
Diaelectric Dia	**4.8 mm**
Dielectric	**PE**
Outer Conductor Dia	**5.4 mm**
Outer Dia	**7.0 mm**
Bending radius	**more than 30 mm**
Impedance	**75 ohms**
D.C Resistance	**50 ohms/KM**
Screening factor	**more than 50**
Attenuation	
50 MHz	**6.5**
100 MHz	**9**
200 MHz	**13**
300 MHz	**16**

6 LAYING OF CONDUITS

Conduits shall be laid either recessed in walls and ceilings or on surface on walls and ceilings or partly recessed and partly on surface, as required.

Same rate shall apply for recessed and surface conduiting in this contract.

Stranded copper conductor insulated wire of size as per schedule of quantities shall be provided in entire conduiting for loop earthing.
Electrical Works : Technical Specifications

GI wire of suitable size to serve as a fish wire shall be left in all conduit runs to facilitate drawing of wires after completion of conduiting.

6.1 Recessed Conduiting

Conduits recessed in concrete members shall be laid before casting, in the upper portion of slabs or otherwise as may be instructed, so as to embed the entire run of conduits and ceiling outlet boxes with a cover of minimum 12 mm concrete. Conduits shall be adequately tied to the reinforcement to prevent displacement during casting at intervals of maximum 1 meter. No

reinforcement bars shall be cut to fix the conduits. Suitable flexible joints shall be provided at all locations where conduits cross expansion joints in the building.

Conduits recessed in brick work shall be laid in chases to be cut by electrical Contractor in brick work before plastering. The chases shall be cut by a chase cutting electric machine. The chases shall be of sufficient width to accommodate the required number of conduits and of sufficient depth to permit full thickness of plaster over conduits. The conduits shall be secured in the chase by means of heavy duty pressed steel clamps screwed to MS flat strip saddles at intervals of maximum 1 meter. The chases shall then be filled with cement and coarse sand mortar (1:3) and properly cured by watering.

Entire recessed conduit work in concrete members and in brick work shall be carried out in close coordination with progress of civil works. Conduits in concrete members shall be laid before casting and conduits in brick work shall be laid before plastering. Should it become necessary to embed conduits in already cast concrete members, suitable chase shall be cut in concrete for the purpose. For minimising this cutting, conduits of lesser diameter than 25 mm and outlet boxes of lesser depth than 50 mm could be used by the Contractor for such extensions only after obtaining specific approval from Consultant /Project Manager . For embedding conduits in finished and plastered brick work, the chase would have to be made in the finished brick work. After fixing conduit in chases, chases shall be made good in most workmanlike manner to match with the original finish.

Cutting chases in finished concrete or finished plastered brick work for recessing conduits and outlet boxes etc shall be done by the Contractors without any extra cost.

6.2 Surface Conduiting

Wherever so desired, conduit shall be laid in surface over finished concrete and/or plastered brickwork. Suitable spacer saddles of approved make and finish shall be fixed to the finished structural surface along the conduit route at intervals not exceeding 600 mm. Holes in concrete or brick work for fixing the saddles shall be made neatly by electric drills using masonry drill bits. Conduits shall be fixed on the saddles by means of good quality heavy duty MS clamps screwed to the saddles by counter sunk screws gitti not to be used for fixing the saddle. Neat appearance and good workmanship of surface conduiting work is of particular importance. The entire conduit work shall be in absolute line and plumb.

6.3 Fixing of conduit fittings and accessories

For concealed conduiting work, the fittings and accessories shall be completely embedded in walls/ceilings leaving top surface flush with finished wall/ceiling surface in a workman like

manner.

Loop earthing wire shall be connected to a screwed earthstead inside outlet boxes to make an effective contact with the metal body.

6.4 Painting and Colour coding of conduits

Before laying, conduits shall be painted specially at such places where paint has been damaged due to vice or wrench grip or any other reason.

If so specified, surface conduits shall be provided with 20 mm wide and 100 mm long colour coding strips as below

Use Code	**colour**
Low voltage	**Grey**
Telephone	**Black**
Earthing system	**Green**
Control system lighting	**Purple**

6.5 Protection of Conduits

To safeguard against filling up with mortar/plaster etc. all the outlet and switch boxes shall be provided with temporary covers and plugs which shall be replaced by sheet/plate covers as required. All screwed and socket joints shall be made fully water tight with white lead paste.

6.6 Cleaning of Conduit Runs

The entire conduit system including outlets and boxes shall be thoroughly cleaned after completion of erection and before drawing in of cables.

6.7 Protection Against Dampness

All outlets in conduit system shall be properly drain and ventilated to minimise chances of condensation/sweating.

6.8 Expansion Joints

When crossing through expansion joints in buildings, the conduit sections across the joint shall be through approved quality heavy duty metal flexible conduits of the same size as the rigid conduit. The expansion joint crossing shall be done as approved by Project Manager.

6.9 Loop Earthing

Loop earthing shall be provided by means of insulated stranded copper conductor wires of sizes as per Schedule of Quantity laid alongwith wiring inside conduits for all wiring outlets and submains.

Earthing terminals shall be provided inside all switch boxes, outlet boxes and draw

boxes etc.

7 LAYING AND DRAWING OF WIRES

7.1 Bunching of Wires

Wires carrying current shall be so bunched in conduits that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit.

7.2 Drawing of Wires

The drawing of wires shall be done with due regard to the following precautions:-

No wire shall be drawn into any conduit, until all work of any nature, that may cause injury to wire is completed. Burrs in cut conduits shall be smoothen before erection of conduits. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Approved type bushes shall be provided at conduit terminations.

Before the wires are drawn into the conduits, conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction by forcing compressed air through the conduits if necessary..

While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which cause breakage of conductors.

There shall be no sharp bends.

The Contractor shall, after wiring is completed, provide a blank metal/sunmica plate on all switch / outlet / junction boxes for security and to ensure that wires are not stolen till switches / outlets etc.. are fixed at no extra cost the contractor shall be responsible to ensure that wires and loop earthing conductors are not broken and stolen. In the event of the wire been partly / fully stolen , the contractor shall replace the entire wiring alongwith loop earthing at no extra cost. No joint of any nature whatsoever shall be permitted in wiring and loop earthing .

7.3 Termination /Jointing of Wires

Sub-circuit wiring shall be carried out in looping system. Joints shall be made only at distribution board terminals, switches/buzzers and at ceiling roses/connectors/lamp holders terminals for lights/fans/socket outlets. No joints shall be made inside conduits or junction/draw/inspection boxes.

Switches controlling lights, fans or socket outlets shall be connected in the phase wire of the final sub circuit only. Switches shall never be connected in the neutral wire.

Wiring conductors shall be continuous from outlet to outlet. Joints where unavoidable,

due to any special reason shall be made by approved connectors. Specific prior permission from Project Manager in writing shall be obtained before making such joint.

Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or wringing.

Strands of wires shall not be cut for connecting terminals. All strands of wires shall be twisted round at the end before connection..

Conductors having nominal cross sectional area exceeding 1.5 sq. mm shall always be provided with crimping sockets. Tinning of the strands shall be done wherever crimping sockets are not available as per instructions of the Project Manager

All wiring shall be labelled with appropriate plastic ferrules for identification.

At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used.

Brass nuts and bolts shall be used for all connections.

The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.
Switches controlling lights, fans, socket outlets etc. shall be connected to the phase wire of circuits only.
Only certified valid license holder wiremen shall be employed to do wiring / jointing work.

7.4 Load Balancing

The Contractor shall plan the load balancing of circuits in 3 phase installation and get the same approved by the Project Manager before commencement of the work.

7.5 Colour Code of Conductors

Colour code shall be maintained for the entire wiring installation - red, yellow, blue for three phases, black for neutral and green for earth.

8. SWITCHES AND FIXTURES

8.1 SWITCHES

All 6 and 16 amps switches shall be of the modular enclosed type flush mounted 220 Volt AC of the best quality and standard or as approved by Interior designer/Architect/Project Manager. The switch moving and fixed contacts shall be of silver nickel and silver graphite alloy and contact tips coated with silver. The housing of switches shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

8.2 FLUSH PLATES

Switches, receptacles and telephone system outlets in wall shall be provided with molded cover plates of shape, size and colour approved by the Project Manager made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material, and secured to the box with counter sunk round head chromium plated brass screws. Where two or more switches are installed together, they shall be provided with one common switch cover plate as described above with notches to accommodate all switches either in one, two or three rows.

One and two gang switch cover plate, telephone outlet cover plate, 6 and 16 amps switched/unswitched plates, shall have the same shape and size. Three and four gang switch cover plates shall have the same shape and size. Six and eight gang switch cover plates shall have the same shape and size. Nine and twelve switch cover plates shall have the same shape and size. Wherever five switches, seven switches, ten switches and eleven switches are to be fixed the next higher size of gang switch cover plate to be used and extra openings shall be provided with blank-off.

8.3 EXTERNALLY OPERATED SWITCHES

Externally operated switches, shall be of general purpose type, 250 volts of the proper size and rating and shall be provided in weather proof enclosures, complete with weather proof gasketed covers. The MCB’s for all externally operated switches shall be separate and of proper rating.

8.4 WALL SOCKET OUTLETS

All 6/16 Amps wall socket outlets unless otherwise mentioned on the drawings shall be switched, five/six round pin and fitted with automatic linear safety shutters to ensure safety from prying fingers. Un-switched 6/16 amp wall socket outlets where called for in the drawings shall be of five/six round pin type. The socket outlets shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

The switch and sockets shall be located in the same plate. The plates for 6 amp switched/unswitched plugs and telephone outlets shall be of the same size and shape.

All the switched and un-switched outlets shall be of the best standard.

An earth wire shall be provided along the cables feeding socket outlets for electrical appliances. The earth wire shall be connected to the earthing terminal screw inside the box. The earth terminal of the socket shall be connected to the earth terminal provided inside the box.

8.5 LIGHTING FIXTURES

The light fixtures and fittings shall be assembled and installed complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the

Project Manager.
Wires brought out from junction boxes shall be encased in GI flexible pipes for connecting to fixtures concealed in suspended ceiling. The flexible pipes shall be provided with a checknut at the fixture end.

Pendant fixtures specified with overall lengths are subject to change and shall be checked with conditions of the job and installed as directed.

All suspended fixtures shall be mounted rigid and fixed in position in accordance with drawings, instructions and to the approval of the Project Manager.
Fixtures shall be suspended true to alignment, plumb, level and capable of resisting all lateral and vertical forces and shall be fixed as required.

All suspended light fixtures etc. shall be provided with concealed suspension arrangement in the concrete slab/roof members. It is the duty of the Contractor to make these provisions at the appropriate stage of construction.

All switch and outlet boxes shall be bonded to earth with insulated stranded copper wire as specified.

Wires shall be connected to all fixtures through connector blocks.

Flexible pipes, wherever used, shall be of make and quality approved by the Project Manager.

9. MEASUREMENT AND PAYMENT OF WIRING

Wiring for lights, fans, convenience socket outlets and telephone outlets etc. shall be measured and paid for on POINT BASIS as itemized schedule of quantities and as elaborated as below unless otherwise stated.

9.1 Primary and Secondary light point wiring

In respect of group control of lights (more than one light controlled by one switch or MCB), wiring upto the first light in the group shall be measured and paid for as a primary light point. Wiring for other lights looped in one group for switch controlled as also MCB controlled lights shall be measured and paid for as secondary light points. Primary light points for switch controlled lights shall include the cost of control switch whereas primary light points controlled by MCBs shall not include the switch cost. The cost of MCB controlling such lights shall not be included in the primary light point rate since the MCB shall be paid for in the item of DB.

The point wiring basis shall assume average wiring length and average conduiting length per point based on parameters stipulated in para 9.2 below. The average wiring length and average conducting length forming the basis of point wiring payment, shall take the electrical layouts of the entire project into consideration. Tenderers are advised to seek clarifications, if they so desire, on this aspect before submitting their tenders. No claim for extra payment on account of electrical layouts in part or whole of the project requiring larger average wiring and

conduiting length per point, whether specifically shown in tender drawings or not, shall be entertained after the award of contract.

9.2 Parameters: Wiring shall be carried out as per following parameters in recessed/ surface conduit system.

- Only looping system of wiring shall be adopted throughout. No joints excepting at wiring terminals shall be permitted.

- All accessories shall be flush type unless otherwise stated.

- Lights, fans and 6 amp socket outlets shall be wired as per the item given in the Bill of

Quantities.

- Power circuits shall normally have maximum two/one 16 amps socket outlet unless otherwise stated. Separate circuit shall be run for each Geyser, Window/Split air conditioners and similar appliances.

- Wiring rates shall include painting of conduits and other accessories as required.

- Wiring rates shall include cleaning of dust, splashes of colour wash or paint from all fixtures, fans, fittings etc. at the time of taking over of the installation.

- Wiring rates shall include blanking of outlet boxes to prevent damage/pilferage of wires.

- Wiring rates shall include circuit wiring from DB to first control switch & shall be done as per Bill of Quantities.

9.3 Definitions

9.3.1 Wiring for Lights

Primary Light Points : Wiring for primary light points, as defined in para 9.1 above, shall commence at the Distribution Board terminals and shall terminate at the ceiling rose/connector in ceiling box/lamp holder via the control switch (for switch controlled lights). Rates for primary light point wiring shall be deemed to be inclusive of the cost of entire material and labour require for completion of primary light point thus defined including : .

- Recessed / surface conduting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required,

- Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires

including terminations etc. complete as required.

□□Control switch with switch box and cover plate of specified type including fixing screws, earth terminal etc. complete as required. Cost of this switch is applicable only for switch controlled points. This cost shall not be applicable for DB controlled points.

□□Loop earthing with insulated copper wires.

Secondary Light points :

Secondary light points, as defined in para 9.1 above, shall cover the cost of interconnection wiring between group controlled light fittings and shall be deemed to be inclusive of the

cost of entire materials and labour required for completion of the secondary light point thus defined including

□□Recessed / surface conduting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required.

□□Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.

□□Loop earthing with insulated copper wires.

9.3.2 Wiring for Ceiling Fans

Wiring for ceiling fan points shall be same as for primary light points.

9.3.3 Wiring for Exhaust Fans
Wiring for exhaust fan points shall be same as for primary light points and shall in addition include the cost of providing a 3/5 pin 6 amp socket outlet near the fan alongwith plug top and a 6 amp control switch at convenient location near the room entry.

9.3.4 Wiring for Call Bell Points
Wiring for call bell points shall be the same as for primary light points. A call bell switch which include in lieu of the control switch at a convenient location as required.

9.3.5 Wiring for Telephone Outlets
Wiring for telephone outlets points shall include the entire wiring and conduiting from the telephone tag block to the telephone outlet including the telephone outlet complete as required and as itemized in the Schedule of Quantities

9.3.6 Wiring for TV Outlets
Wiring for TV outlet points shall include the entire wiring and conduiting from the central point to the TV outlet including the TV outlet complete as required and as itemized in the Schedule

of Quantities

9.3.7 Wiring for Convenience Socket Outlets

3/5 pin 6 amps and 3/6 pin 16 amps single phase switched convenience socket outlets shall be provided in the building as indicated in the layout drawings. In addition, combined 3 pin 6 / 16 amps socket outlets at modular intervals in special PVC raceway over the work tables in laboratories shall be provided. Wherever required, 20/32/50 amps single phase and 32/50 amps

3 phase outlets shall also be provided.

Wiring for 3/5 pin 6 amps convenience socket outlets
Point wiring for 3/5 pin 6 amps socket outlets (in locations other than over the laboratory work tables) on point wiring basis shall be the same as primary light point defined in para 8.3.1 and shall in addition include 3/5 pin 6 amp socket outlet with 6 amp control switch in MS box with cover including loop earthing of the third pin complete as required as as itemised in scheduled of quantities.

Wiring for 3/6 pin 16 amps convenience socket outlets
Point wiring for 3/6 pin 16 amps socket outlets (in locations other than over the laboratory work tables) on point wiring basis shall be the same as primary light point defined in para 8.3.1 and shall in addition include 3/6 pin 16 amp socket outlet with 16 amp control switch in MS box with cover including loop earthing of the third pin complete as required as itemised in scheduled of quantities.

Wiring for special socket outlets

In addition to the above, special convenience outlets of 20/32/63 Amps single phase and 32/63 Amps three phase, required in few locations as indicated in the layout drawings, shall be paid for on linear basis as itemised in schedule of quantities. Outlets only shall be paid separately in numbers as per actuals. Wiring alongwith loop earthing shall be paid separately on running meter basis and conduiting /PVC raceway shall be paid separately on running meter basis.
9.3.8 Submains wiring

Submains wiring shall be measured from outer end of the boxes. Extra Loop length shall be left at each end as required.

10. ROUTINE AND COMPLETION TESTS

10.1 Installation Completion Tests

At the completion of the work, the entire installation shall be subject to the following tests:
1. Wiring continuity test
2. Insulation resistance test
3. Earth continuity test

4. Earth resistivity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

10.2 Wiring Continuity Test

All wiring systems shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energized.

10.3 Insulation Resistance Test

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all protection in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 megaohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one megaohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between he two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a Megaohm or when PVC insulated cables are used for wiring 12.5 Megaohms divided by the number of outlets.

Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Megaohms is acceptable.

10.4 Testing Of Earth Continuity Path

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same alongwith the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

10.5 Testing Of Polarity Of Non-Linked Single Pole Switches

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three of four wire installation, a test shall be made to verify that every nonlinked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Project Manager as well as the local authorities.

10.6 Earth Resistivity Test

Earth resistivity test shall be carried out in accordance with latest IS Code of Practice for earthing.

10.7 Performance

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

10.8 Tests And Test Reports

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Project Manager for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge. All test reports shall be approved by the Project Manager prior to energizing of installation.

C) TELEPHONE WIRING SYSTEM:

1.0 SCOPE :

This section relates to specification for the supply, installation, testing & commissioning of works included telephone system.

The scope of work included in this section is as follows :
a) Supply, installation and laying of telephone cables/ wires.
b) Providing & installing medium duty PVC conduit.
c) Providing & installing G.I./PVC moulded boxes including plug in type telephone outlets.

2.0 CONDUITING :

2.1 All concealed /surface installation including the conduit run above the false ceiling space shallbe heavy gauge black enameled PVC Conduit. The specification for materials & installation shallbe same as described in electrical section. All relevant clauses are applicable for telephone system as well. The conduit for telephone system shall be installed minimum 20 cm away from the power conduit. Care shall be taken so that no telephone conduit is run in parallel to Electrical conduit in close proximity. Wherever telephone conduits cross power conduits, they shall be at right angle, to each other. All telephone conduits shall be earthed.

3.0 TELEPHONE DISTRIBUTION BOARDS (TAG BLOCK):

3.1 Telephone distribution network shall be provided with Main Telephone Distribution board forbuilding located in Basement level. At each floor, Telephone distribution board tag block shall
be provided in telephone shaft/cupboard. Telephone tag block shall be double jumpering type. Tag block shall be mounted in MS box fabricated from 1.63mm thick sheet steel. Box shall undergo a rigorous metal treatment process i.e. degreasing, pickling, phospating, pasivating in deoxalate solution, dry with compressed air in dust free atmosphering facility, disconnection module shall be in multiple of 10 pairs. Disconnection unit shall be mounted on back mounting frame. Protection against over voltage through protection magazine shall be provided from rear of Disconnection Module.

3.2 Telephone distribution box shall have back mounting frame, disconnection module, lock & key
arrangement. Contractor shall also provide one pair of wiring tools, test cord, disconnection plug, wiring base. Cost of these item shall deemed to be included in quoted rates.

3.3 Main telephone distribution board shall be provided with protecting magazine with GD tubes forprotection from over voltage. MTDB shall be complete with back mounting frame. Disconnection module, lock & key arrangement. MTDB box shall be fabricated from 2mm thick sheet steel.

D) MEDIUM VOLTAGE DISTRIBUTION BOARDS

1 GENERAL

This section covers specification of DBs.

2. STANDARDS AND CODES

The latest and amended upto date Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

3. MINIATURE CIRCUIT BREAKERS

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system.
The MCB's shall have a rupturing capacity of 10 KA at 0.5 p.f.
The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with XLPE cable characteristic.
Type test certificates from independent authorities shall be submitted with the tender.

4. FINAL DISTRIBUTION BOARDS

Final distribution boards shall be flush mounting, totally enclosed, dust and vermin proof and shall comprise of miniature circuit breakers, earth leakage circuit breakers, neutral link etc as detailed in the schedule of quantities.

The distribution equipment forming a part of the Distribution Boards shall comply to the relevant Standards and Codes of the Bureau of Indian.

The board shall be fabricated from 16 gauge CRCA sheet steel and shall have a hinged lockable spring loaded cover. All cutouts and covers shall be provided with synthetic rubber gaskets. The entire construction shall give a IP 42 (double door and four tierarrangement) degree of protection.

The bus-bar shall be of electrical grade copper having a maximum current density of 1.6 ampere per square mm and PVC insulated throughout the length. The minimum spacing between phases shall be 25 mm and between phase and earth 19 mm

Separate neutral link for each phase shall be provided.

All the internal connections shall be with either solid copper PVC insulated or copper conductor PVC insulated wires of adequate rating.

All the internal connections shall be concealed by providing a hinged protective panel to avoid accidental contact with live points.
All outgoing equipment shall be connected direct to the bus bar on the live side. The equipment shall be mounted on a frame work for easy removal and maintenance.

The sheet steel work shall undergo a rigorous rust proofing process, two coats of filler oxide primer and final powder coated paint finish.
All the circuits shall have an independent neutral insulated wire, one per circuit, and shall be numbered and marked as required by the Project Manager.

A sample of the completed board is to be got approved by the Project Manager before commencement of supply and erection.

Before commissioning, the distribution boards shall be megger tested for insulation and earth continuity.

5 SHEET STEEL TREATMENT AND PAINTING

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognized phosphating process. The steel work shall then receive two costs of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment be given powder coated finish painted with two coats of approved shade on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

6. NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

E) MEDIUM VOLTAGE PANELS:

1.0 GENERAL

Medium voltage power control centres (generally termed as switchboard panels) shall be in sheet steel clad cubicle pattern, free floor standing, totally enclosed, compartmentalized design having multitier arrangement of the incomers and feeders as per details given in the schedule of quantities. All panels shall conform to the requirements of the latest addition of IS and shall be suitable for 415 V, 3 phase AC supply or 230 V single phase AC supply as required.

2.0 CONSTRUCTIONAL FEATURES

The Switch Boards shall be totally enclosed, sheet steel cubicle pattern, extensible on either side, dead front, floor mounting type (wall mounting if specifically asked for in BOQ) and shall have a bus bar chamber at the top and the cable entry from the bottom. (For panel requiring top cable entries if any, refer to BOQ). The cable terminations should be inside the feeder compartment only.

The Switch Boards shall be completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of ingress protection of IP 43 for indoor & IP 55 for outdoor. All doors and covers shall also be fully gasketed with synthetic rubber. All the live

parts shall be properly shrouded with FRP sheets.

The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal. Base channel shall be fabricated from ISMC 75 and door shall be provided at the bottom with arrangement for fixing bolts in the foundation. All panels and door covers shall be properly fitted and square with the frame. The cutouts in the panel shall be correctly positioned.

Lifting lugs of adequate strength shall be provided on each transport section of the panels. Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

3.0 SWITCHBOARD DIMENSIONAL LIMITATIONS

A base channel 75 mm x 5 mm thick shall be provided at the bottom.
The overall height of the Switch Board shall be limited to 2200 mm
The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1900 mm from finished floor level.

4.0 BUS BARS

The bus bars shall be suitable for 4 wire, 415 volts, 50 Hz, system. The main bus bar shall be made of high conductivity electrolytic grade AL 91E Aluminium. The bus bars shall have uniformcross section throughout the panel. The bus bars shall be capable of carrying the rated current at 415 volts continuously. The bus bar will run in a separate busbar chamber using bus insulators made of non-deteriorating, vermin proof, non hygroscopic materials such as epoxy fiber, reinforced polyester or moulding compound (min. 25mm clearance between phase to phase & phase to neutral busbars shall be provided). The interval between the two insulators will be designed after considering the following:

a) Strength and safe load rating of the insulator,
b) The vibrating force generated during a fault,
c) A Factor of safety of 1.25
d) A set of insulators at both ends of the bus.

Bus bars shall be sized considering maximum current density of 1 Amps/ cross section sq.mm area. The size of the bus bar calculations must be approved by the consultants. The bus bars shall be designed to withstand a temperature rise of 45oC above the ambient. To limit the temperature rise in the bus bar chamber a set of louvers can be provided at strategical places considering the air circulation.

All the bus bars shall be insulated with PVC heat shrinking sleeves throughout (except at joints) the length of the panel. The electro-galvanised high tensile steel nuts, bolts, plain or spring

washers of suitable size will be used in connecting the various section of the bus bars.

5.0 SWITCH BOARD INTERCONNECTIONS

All connections between the bus bars/Breakers terminations shall be through solid Aluminium strips of adequate size to carry full rated current which shall be PVC/fibre glass insulated.
For switch unit ratings upto 63A PVC insulated copper conductor wires of adequate size to carry full load current can be used. The terminations of all such interconnections shall be properly crimped.

6.0 CABLE TERMINATIONS

Knockout holes of appropriate size and number shall be provided in the Switch Board in conformity with the location of incoming and outgoing conduits/cables. All cable entries shall be from bottom until & unless specifically asked for in the BOQ.
The cable terminations of the circuit breakers shall be brought out to terminal cable sockets suitably located in the panel.

All outgoing links for FSU\MCB feeders shall be in the feeder compartment only.
The Switch Boards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor PVC cables.

7.0 EARTHING

The panels shall be provided with an aluminium earth bus of suitable size running through out the length of the switchboard. Suitable earthling eyes/bolts (at min. two points) shall be provided on the main earthing bus to connect the same to the earth grid at the site. Sufficient number of star washers shall be provided at the joints to achieve earth continuity between the panels and the sheet metal parts.

8.0 INTERLOCKING

The panels shall be provided with the following interlocking arrangement.

a) The door of the switch-fuse compartments is so interlocked with the switch drive or handle that the door can be opened only if the switch is in `OFF' position. De-interlocking arrangement shall also be provided for occasional inspection.
b) It shall not be possible for the breaker to be withdrawn when in `ON' position.
c) It shall not be possible for the breakers to be switched on unless it is either in fully inserted positions or for testing purposes in fully isolated position.
d) The breaker shall be capable of being raked in to `testing' `isolated' and `maintenance' positions and kept locked in any of these position.
e) A safety latch to ensure that the movement of the breaker as it is withdrawn, is checked before it is completely out of the cubicle shall be provided.

9.0 WIRING

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq.mm except for the circuits related to current transformers or circuits with current carrying capacity more than 5 Amps (for which min. 2.5 Sq.mm copper conductor wires shall be used).

10.0 SHEET STEEL TREATMENT AND PAINTING

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulfuric acid and a recognised phosphating process. The steel work shall then receive two coats of oxide primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment shall be powder coated with shade RAL 7032 (Siemens Gray) on the outside of the panel and mounting plates shall be of orange shade. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns (shade of paint may be changed if the client so desires).

11.0 NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

12.0 INSTALLATION

Installation shall be done by other agencies. However, the foundation requirements shall be submitted by the supplier. In addition the supplier shall coordinate with the erection contractor for shifting & installation of the panels.

13.0 TESTING AND COMMISSIONING

Copies of type tests and routine test as per relevant specification, carried out at manufacturer’s work shall be submitted to the CLIENT as required.

Wiring and connections including earthing shall be checked for continuity and tightness. Insulation shall be measured with a 500 V megger and insulation resistance shall not be less than 100 Mega ohms

Interlocking operation to be checked as per requirement.
Tests shall be performed in presence of authorized representative of the CLIENT for which the contractor shall give due prior notice.

14.0 HIGH VOLTAGE TEST

A high voltage test with 2.5 KV for one minute shall be applied between the poles and earth. Test shall be carried out on each pole in turn with the remaining poles earthed, all units raked in position and the breakers closed. Original test certificate shall be submitted along with panel.

15.0 PRE-COMMISSION TESTS:

Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried in the presence of Architect's/Consultant's or their representatives.

i) All main and auxiliary bus bar connections shall be checked and tightened.
ii) All wiring termination and bus bar joints shall be checked and tightened.
iii) Wiring shall be checked to ensure that it is according to the drawing.
iv) All wiring shall be tested for insulation resistance by a 1000 volts meggar.
v) Phase rotation tests shall be conducted
vii) All relays and protective devices shall be tested for correctness of settings and operation by introducing a current generator and an ammeter in the circuit.

16.0 CLIMATIC CONDITIONS:

The panels & switch gear components shall be suitable for following climatic conditions:
Maximum Minimum
DBT 45OC 3OC
RH 90% 20%

17.0 HEATING ARRANGEMENT:

The panel shall be provided with a thermostatically controlled heating arrangement for monsoon (200 Watt) to take care of high humidity conditions. A 6/16A service socket outlet (single phase) shall be provided in one of the compartments in all the panels.

F) METERING, INSTRUMENTATION AND PROTECTION

Ratings, type and quantity of meters, instruments and protective devices shall be as per Bill of Quantities.

1.0 CURRENT TRANSFORMERS

CTs shall confirm to latest IS codes in all respects. All CTs used for medium voltage application shall be rated for 1 kV. CTs shall have rated primary current, rated burden and class of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be 0.5 to 1 and for protection class 10. CTs shall be capable of withstanding magnetic and thermal stresses due to short circuit faults. Terminals of CTs shall be paired permanently for easy identification of

poles. CTs shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each CT shall be provided with rating plate indicating :

- Name and make
- Serial number
- Transformation ratio
- Rated burden
- Rated voltage
- Accuracy class

CTs shall be mounded such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

2.0 POTENTIAL TRANSFORMER

PTs shall confirm to latest amendment upto date IS Codes.

3.0 MEASURING INSTRUMENTS

Direct reading electrical instruments shall conform to latest IS codes in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -100C and +5000C. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould . Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from out side. Direction of deflection shall be from left to right. Selector switches shall be provided for ammeters and volt meters used in three phase system.

4.0 AMMETERS

Ammeters shall be of digital type. Ammeters shall be manufacture and calibrated as per latest IS.

Ammeters shall normally be suitable for 5 A secondary of current transformers.

Ammeters shall be capable of carrying substantial over loads during fault conditions.

5.0 VOLTMETERS

Voltmeters shall be digital type of 3 phase 415 volt voltmeters shall be 0-500. Volt meters shall be provided with protection of 2A MCB.

6.0 KWH METER

Meter shall be of 3 phase digital type and shall be provided with a maximum demand indicator.

7.0 POWER FACTOR METERS

3 phase power factor meters shall be of digital type with current and potential coils suitable for operation with current and potential transformers provided in the panel. Scale shall be

calibrated for 50% lag - 100% - 50% lead readings. Phase angle accuracy shall be +40.

8.0 ENERGY AND REACTIVE POWER METERS

Trivector meters shall be two element, integrating type, KWH, KVA, KVA hour reactive meters. Meters shall confirm to latest IS in all respects. Energy meters, KVA, and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy conception of 500 hours corresponding to maximum current at rated voltage and unity power factor. Meters shall be suitable for operation with current and potential transformers available in the panel.

9.0 RELAYS

Protection relays shall be provided with flag type indicators to indicate cause of tripping. Flag indicators shall remain in position till they are reset by hand reset. Relays shall be designed to make or break the normal circuit current with which they are associated. Relay contacts shall be of silver or platinum alloy and shall be designed to withstand repeated operation without damage. Relays shall be of draw out type to facilitate testing and maintenance. Draw out case shall be dust tight. Relays shall be capable of disconnecting faulty section of network without causing interruption to remaining sections. Analysis of setting shall be made considering relay errors, pickup and overshoot errors and shall be submitted to Project Manager for approval.

10.0 OVER CURRENT RELAYS

Over current relays shall be induction type with inverse definite minimum time lag characteristics. Relays shall be provided with adjustable current and time settings. Setting for current shall be 50 to 200 % insteps of 25%. The IDMT relay shall have time lag (delay) of 0 to 3seconds. The time setting multiplier shall be adjustable from 0.1 to unity. Over current relays shall be fitted with suitable tripping device with trip coil being suitable for operation on 5 Amps.

11.0 EARTH FAULT RELAY

Same as over current relay excepting the current setting shall be 10% to 40% in steps of 10%.

12.0 UNDER VOLTAGE RELAY

Under voltage relays shall be of induction type and shall have inverse limit operation characteristics with pickup voltage range of 50 to 90% of the rated voltage.

13.0 POWER FACTOR CORRECTION CAPACITORS

Power factor correction capacitors shall conform to latest IS codes in all respects. Approval of insurance association of India shall be obtain if called for. Capacitors shall be suitable for 3 phase 415 volts 50 HZ supply and shall be available in single and three phase units of 25, 50 & 100 kVAR sizes as specified. Capacitor shall be usable for indoor use, permissible overloads being as below.

Voltage overloads shall be 10% for continuous operation and 15% for six hours in a 24 hours cycle.
Current overloads shall be 15 % for continuous operations and 50% for six hours in a 24 hours cycle.
Over load of 30% continuously and 45% for six hours in a 24 hours cycle.

Capacitors shall be hermetically sealed in sturdy corrosion proof sheet steel containers and impregnated with non inflammable synthetic liquid. Every element of each capacitory unit shall be provided with its own built in protection. Capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 volts or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnants The capacitors shall withstand power frequency test voltage of 2500 volts AC for one minute. Insulation resistance between capacitors terminals and containers when a test voltage of 500 volts DC is applied shall not be less than 50 meg.ohms.

14.0 CONTROL DEVICES

a) Push Buttons

The push buttons used in the panels will be rated for more than 415 volts and 2 amps. All the push buttons will be mounted on the front door and the assembly will be in two parts. All the push buttons will be mounted on the front door of the cubicle in regular symmetrical fashion as per the general norms being practiced. Only one make of push buttons will be used in the assembly of all the panels. The selection of the colour of the push buttons will be as follows

Function	Colour
Starting/Switching ON	Green
Stopping/Switching OFF	Red
Resetting	Black
Forward ON	Yellow
Reverse ON	Blue
Emergency OFF	Red/Mushroom

b) Indicating Lights

The indicating lights used in the panel will be pleasant looking and round shape having the following features;

1. A separate front lens for it's easy replacement.
2. Facility to replace the bulb from the front.
3. Baynet pin cap bulbs of standard size to be used.
4. The shape of the lens to allow viewing from sides.
5. Series resistance with use of low voltage bulb for longer life.
6. Clear and distinct indication for light ON and OFF with differences of brightness of the lens.

The selection of the colours of the indicating lamps will be as follows:
- Red for system in operation
- Amber for system ready for operation.
- Green for system being put off.
- Red, yellow and blue for incoming supply.

15.0 TESTING

15.1 Instrument transformers shall be tested at factory as per IS:2705 & IS:3156. The test shall incorporate the following:

a) Type tests
b) Routine tests

Original test certificates in triplicate shall be provided.

15.2 Meters shall be tested as per IS: 1248. The tests shall include both type tests and routine tests.
Original test certificate in triplicate shall be furnished.

15.3 a) Suitable injection tests shall be applied to the secondary circuit of every instrument to establish the correctness of calibration and working order.

b) All relays and protective devices shall be tested to establish correctness of setting and operation by introducing a current generator and an ammeter in the circuit.

G) MINIATURE CIRCUIT BREAKERS

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system. MCB’s shall be quick make and break type conforming to relevant IS. Housing shall be heat resistant and have a high impact strength. MCB’s shall be flush mounting type and shall be provided with trip free manual operating liver with ON/OFF indications

MCB’s shall be provided with magnetic thermal releases for over current and short circuit protection. The overload or short circuit device shall have a common trip bar in case of DP and TPN MCB’s. The MCB’s shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with H.R.C. fuse/PVC cable characteristic.

The MCB's shall have a minimum breaking capacity of 10 kA at 230/415 volts in accordance with IEC : 898 - 1995 and IS : 8828 - 1996

H) MOULDED CASE CIRCUIT BREAKERS

1.0 GENERAL

Moulded case circuit breakers shall be incorporated in the switch board wherever specified. MCCB shall conform to IEC:947-II or IS:13947-II in all respects. MCCB shall be suitable for threephase 415 volts AC. Suitable discrimination shall be provided between upstream and down stream breakers in the range of 10-20 milli seconds. All MCCBs will have earth fault module (if specifically asked) and front operated. All four pole MCCB shall be suitable for three phase four wire system, with the neutral clearly identified and capable of first make last break feature.

2.0 CONSTRUCTION

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material, operating handle shall be quick make/quick break. The operating handle shall have suitable `ON' `OFF' and `TRIPPED' mechanical indicators notable from outside. All MCCBs shall have a common operating handle for simultaneous operation and tripping of all the three phases. The MCCB should be suitable for disconnection and isolation with marking on front name plate.

Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be thermal-magnetic type provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Thermal magnetic tripping device shall have IDMT characteristics for sustained over load and short circuits. All MCCBs above 250 Amps will also have short circuit magnetic pickup level adjustment. MCCBs

All MCCBs shall have variable thermal overload releases which can be adjusted at site.
3.0 Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances. All MCCBs of higher ratings above

250 Amps, shall be provided with separate extended arcing contacts.

4.0 INTERLOCKING

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of a switch board.
a) Handle interlock to prevent unnecessary manipulations of the breaker.
b) Door interlock to prevent the door being opened when the breaker is in ON or OFF position.
c) Defeat-interlocking device to open the door even if the breaker is in ON position.

5.0 BREAKING CAPACITY

The moulded case circuit breaker shall have a rated service. Short circuit breaking capacity of not less than 25 KA rms at 415 volts AC. Wherever required, higher breaking capacity breakers to meet the system short circuit fault shall be used.

6.0 ACCESSORIES

All the accessories like shunt, under voltage contact blocks shall be of snap fitting possible at site.

7.0 TESTING

a) Original test certificate of the MCCB shall be furnished.
b) Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

I) MEDIUM VOLTAGE AIR CIRCUIT BREAKER

1.0 GENERAL

The ACBs shall comply to IEC 60947 Part I & II and IS 13947 Part I & II and shall be suitable for operation on 415 Volts, 50 Hz 3 Phase system.

The breaker shall comply with Isolation function requirements of IEC 60947, Part-II, section 7.12 and shall be clearly marked as “Suitable for Isolation / Disconnection” to ensure safety of operating personnel.

The ACB shall provide Class –II insulation between front panel and internal power circuit as per IEC 60947 Part II Section-7.12 to avoid accidental contact with live parts during inspection & maintenance.

The ACB shall be 3/4 pole with modular construction, draw out, manually/electrical operated and shall be capable of providing short circuit, overload and earth fault protection with time delay through micro processor based control unit sensing the true RMS value to ensure accurate measurement meeting the EMI/EMC requirement as per standard.

The circuit breakers shall be for continuous rating and service short Circuit Breaking capacity shall be as specified on the single line diagram and shall be equal to the short circuit withstand values for 40 KA & 60 KA.

For ALL ACBs Ics = Icu = Icw (1 sec)

Circuit breakers shall be designed to ‘close’ and ‘trip’ without opening the circuit breaker compartment door. The operating handle and the mechanical trip push button shall be at the front of the breakers panel and integral with the breaker. The ACB shall be provided with a door interlock.

2.0 CONSTRUCTIONAL FEATURES

All Air Circuit Breakers (ACB) shall be 3 / 4 pole with modular construction and moulded housing, flush front, and draw out type and shall be provided with a trip free manual operating

mechanism or as indicated in drawings and bill of quantities with mechanical “ON” “OFF” “TRIP” indications. ACB shall have inbuilt Anti pumping feature.

The contacts shall be of silver-plated copper with moving and fixed contacts totally enclosed for enhanced safety and inaccessibility to live parts.

The cradle shall be so designed and constructed as to permit smooth withdrawal and insertion of the breaker into it. The movements shall be free from jerks, easy to operate.

The current carrying capacity of neutral pole shall be equal to main poles. Four pole ACBs shall have 4th pole / neutral protection adjustable at site at 100%, 50% or 0%.

There shall be 4 distinct and separate position of the circuit breaker on the cradle.
Service Position Main Isolating contacts and Control contacts of the breaker are engaged.
Test Position Main Isolating contacts are isolated but control contacts are still engaged.
Isolated Position Both main isolating and control contacts are isolated.

Maintenance Circuit breaker fully outside the panels ready for maintenance after the cubicle door is opened.

There shall be provision for locking the breaker in any or all of the first three positions.
There shall be mechanical indicator on the front panel for “READY TO CLOSE” situation for the breaker by checking all inter-locking

3.0 PROTECTION FUNCTIONS

a. Microprocessor based Trip Unit

The Microprocessor based release shall be an integral part of ACB provided on circuit breaker for short circuit, over load and earth fault protection with adjustable current & time settings along with LCD display for displaying of instantaneous value of phase, neutral and earth leakage currents. LED bar-graph shall simultaneously display the load level on three phases.
The release shall incorporate microprocessor to offer accurate, faster and versatile protection with complete flexibility and shall offer complete over current protection to the electrical system in the following zones.

i) Overload or long time protection with adjustable time delay
ii) Short circuit or short time protection with adjustable time delay.
iii) Instantaneous protection with no intentional delay.
iv) Ground fault protection with time delay.
v) Zone Selective Interlocking.

The release shall sample the current to monitor the actual load current waveform flowing in the system and shall monitor the true RMS value of the load current. It shall take into account

the effect of harmonics also. Release shall acknowledge the currents & time delay settings done by user on the LCD display.

The trip unit shall be communication capable for present / future integration into BMS systems.

b. Thermal Memory

When the breaker shall reclose after tripping on overload, then the thermal stresses caused by the overload if not dissipated completely, shall get stored in the memory of the release and this thermal memory shall ensure reduced tripping time in case of subsequent overloads. Realistic Hot/Cold curves shall take into account the integrated heating effects to offer closer protection to the system.

c. Defined Time – Current Characteristics:

A variety of pick-up and time delay settings shall be available to define the current thresholds and the delay to be set independently for different protection zones thereby achieving a close – to – ideal protection curve.

d. Trip Indication:

LED Fault status indicators along with remote fault signaling shall be provided to display the type of fault that caused a trip, without any external auxiliary supply or battery, resulting in faster fault diagnosis and reduced system down time.

e. Test Facility

Test facility to test the operation of the release in different protection zones by simulating CT inputs externally through a testing kit.

f. Self Powered

The release shall draw its power from the main breaker CTs and shall require no external power supply for its operation.

g. Tripping of the Breaker

The release shall trip the breaker directly the breaker trip rod.

h. Zone Selective Interlocking

The release shall be suitable for communication between breakers to enable zone selective interlocking. This feature shall be provided for both short circuit and ground fault protection zones to offer intelligent discrimination between breakers. This feature enables faster clearance of fault conditions, thereby reducing the thermal and dynamic stresses produced

during fault conditions and thus minimize the damage to the system.

i. Rated insulation voltage shall be 1000 volts AC.

j. Accessories

All the control wiring of ACB shall be accessible from front along with accessories like Aux contacts U/V, Shunt and Closing coil. All the accessories shall be rated for continuous operation.

4.0 Minimum 4 No and 4 NC auxiliary contacts shall be provided on each breaker. The contacts shall be rated 4 amps. The auxiliary contact blocks shall be so located as to be accessible from the front. The auxiliary contacts in the trip circuits shall close before the main contacts have closed. All other contacts shall close simultaneously with the main contacts. The auxiliary contacts in the trip circuits shall open after the main contacts open.

5.0 SAFETY FEATURES

1. The safety shutter shall prevent inadvertent contact with isolating contacts when breaker is withdrawn from the Cradle.

2. It shall not be possible to interchange two circuit breakers of two different thermal ratings.
3. There shall be provision of positive earth connection between fixed and moving portion of the ACB either thru connector plug or sliding solid earth mechanism. Earthing bolts shall be provided on the cradle or body of fixed ACB.
4. Arc Chute covers wherever necessary shall be provided.
5. The incoming panel accommodating ACB shall be provided with indicating lamps for ONOFF positions, digital voltmeter and ammeter of size not less than 96 mm x 96 mm.
Selector switches, MCB for protection circuit and current transformers.
6. It shall be possible to bolt the draw out frame not only in connected position but also in TEST and DISCONNECTED position to prevent dislocation due to vibrating and shocks.

J) H.V. CABLES:

1.0 GENERAL :

The cables shall be supplied, inspected, laid, tested and commissioned in accordance with Drawings.

Specifications, Indian Standard Specifications as per latest IS and cable manufacturers instructions.

The cables shall be of reputed make.

The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly

followed. The installation of cables shall be done by an approved, qualified and experienced personin this trade.

2.0 MATERIAL :

The H.V. cables shall be 11 KV, aluminium conductor CROSS LINKED POLYETHYLENE (XLPE) steel tape armoured cable laid underground and or in masonry trenches as shown on Drawings. The conductor shall be made of Electrical purity aluminium wires and stranded together and compacted. The cable shall be of 3 Core type. The insulation shall be of high quality cross linked polyethylene applied by extrusion process. Both conductor and the insulator are provided with shielding made of Semi Conducting compound. Armouring is applied over inner sheath and shall be of flat steel strips. The outer sheath shall be of heat resisting tropodur (PVC) compound. This shall be of black colour.

3.0 JOINTS IN CABLES :

The contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoidance of jointing cable. This apportioning shall be got approved by the Owner/Consultant before the cables are cut to lengths. Where joints are unavoidable, the location of such joints shall be got approved by the Owner/Consultants.

4.0 JOINTING BOXES FOR CABLES:

Cable joint boxes shall be of appropriate size, suitable for aluminium conductor XLPE insulated cables of 11000 volts ratings.

5.0 JOINTING CABLES:

All cable joints shall be made in suitable, approved cable joint boxes. Jointing of cables in the joint boxes and the filling in of compound shall be done in accordance with the best practice in trade, in accordance with manufacturer's instructions and in an approved manner. All straight Tjoints shall be done in epoxy mould boxes with TROPOLIN/M-SEAL epoxy resin or approved equal. All jointing accessories shall also be manufactured by Indian Cable Corporation/CCI or approved equal. All terminal ends of conductors shall be heavily soldered upto atleast 50mm length.

All cables shall be jointed colour to colour and tested for continuity and insulation resistance before jointing commences. The seals of cables must not be removed until preparations for jointing are completed. Joints shall be finished on the same day as commenced and sufficient protection for the weather shall be arranged. Joints shall be made by means of suitable solder for conductors, the conductors being firmly butted into the connections or thimbles or ferrules and the whole soldered with proper solder and soldering flux or resin. The conductors shall be

efficiently insulated with high voltage insulating tape and use of spreaders of approved size and pattern. The joints shall be completely filled with epoxy compound being topped as necessary to ensure that the box is properly filled.

6.0 CABLE TERMINATIONS:

Cable termination shall be done in terminal cable box using cable glands as specified in BOQ and the cable ends sealed with sealing compound.

7.0 TESTING OF CABLES:

]Prior to burying cables, following tests shall be carried out:

a) Insulation between phases and between phase and earth for each length of cables, before and after jointing.
b) For H.V. cables, high voltage test by applying 17.5KV DC voltage for 15 minutes for each core and earth.
On completion of cable laying work, the following tests shall be conducted in the presence of the Owner/Consultants.
a) Insulation Resistance Test (sectional and overall)
b) Continuity resistance test.
c) Sheathing continuity test.

d) Earth test.

All tests shall be carried out in accordance with relevant Indian standard code of practice and Electricity Rules. The contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests.

K) MV CABLES

1.0 STANDARDS OF CODES

This chapter covers the specifications for supply and laying of Medium Voltage XLPE cables. All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

2.0 CABLES

Medium voltage cables shall be aluminium conductor XLPE insulated, PVC sheathed armoured conforming to latest IS. Cables shall be rated for a 1100 Volts.

All Conductor cables shall be as per BOQ.
Conductors shall be insulated with high quality XLPE base compound. A common covering (bedding) shall be applied over the laid up cores by extruded sheath of unvulcanised compound. Armouring shall be applied below outer sheath of PVC sheathing. The outer sheath shall bear the manufacturer's name and trade mark at every meter length. Cores shall be provided with

following colour scheme of PVC insulation.
1 Core : Red/Black/Yellow/Blue
2 Core : Red and Black
3 Core : Red, Yellow and Blue
3 ½ /4 Core : Red, Yellow, Blue and Black
3.0 STORING, HANDLING, LAYING, JOINTING AND TERMINATION
Storing

All the cables shall be supplied in drums. On receipt of cables at site. It should be ensured that both ends of the cables are properly sealed to prevent ingress/absorption of moisture lay the insulation. The cables shall be inspected and stored in drums with flanges of the cable drum in vertical position. Whenever cable drums have to be moved over short distances, they should be rolled in the direction of the arrow, marked on the drum and while removing cables from the drums the drum shall be properly mounted on jacks or on a cable wheel or any other suitable means making sure the spindle, jack etc. are strong enough to take the weight of the drum.

Laying

Cables shall be laid as per the specifications given below :

i) Duct system
Wherever specified such as road crossing, entry to building or in paved area etc. cables shall be laid in under ground ducts. The duct system shall consists of a required number of stone ware pipes, GI, CI or spun reinforced concrete pipe with simplex joints and all the jointing work shall be done according to the CPWD building specifications or as per the instructions of the Engineer-In-Charge as the case may be. The size of the pipe shall not be less than 100mm in diameter for a single cable and shall not be less than 150mm for more than one cable and so on. The pipe shall be laid directly in ground without making any special bed but wherever asbestos cement pipes are used, the pipes shall be encased in concrete of 75mm thick. The ducts shall be properly anchored to prevent any movement.

The top surface of the cable ducts shall not be less than 60 cm. below the ground level. The ducts shall be laid a gradient of at least 1:300. The duct shall be provided manholes of adequate size at regular intervals for drawing the cables. The manhole cover and frame

shall be of cast iron and machine finished to ensure a perfect joint. The manhole covers shall be installed flush with the ground or paved surfaces. The duct entry to the manholes shall be made leakproof with lead-wool joints. The ducts shall be properly plugged at the ends to prevent entry of water, rodents, etc. Suitable duct markers shall be placed along the run of the cable ducts. The duct markers shall at least be 15 cm. square embedded in concrete, indicating duct. Suitable cable supports made of angle iron shall be provided in the manholes for supporting the cables. Proper identification tags shall be provided for each cable in the manholes.

ii) Cables in outdoor trenches

Cable shall be laid in outdoor trenches wherever called for. The depth of the trenches shall not be less than 75cm from the final ground level. The width of the trenches shall not be less than 45 cm. However, where more than one cable is laid, an axial distance of not less than 15 cm. shall be allowed between the cables. The trenches shall be excavated in reasonably straight line with vertical side walls and with uniform depth. Wherever there is a change in direction suitable curvature shall be provided complying with the requirements. Suitable shoring and propping may be done to avoid caving in of trench walls. The bottom of the trench shall be level and free from stone brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 cm. in depth.
The cable shall be pulled over rollers in the trench steadily and uniformly without jerks and strains. The entire cable length shall as far as possible be paved of in one stretch. However where this is not possible the remainder of the cable may be removed by "Flaking" i.e. by making one long loop in the reverse direction. After the cable has been uncoiled and laid into the trench over the rollers, the cable shall be lifted slightly over the rollers beginning from one end by helpers standing about 10 mtrs. apart and drawn straight. The cable should then be taken off the rollers by additional helpers lifting the cable and then laid in a reasonably straight line.

For short cut runs and sizes upto 50 sq.mm of cables upto 1.1 KV grade any other suitable method of direct handling and laying can be adopted with the prior approval of the Engineer-in-charge.

When the cable has been properly straightened, the cores are tested for continuity and insulation resistance and the cable length then measured. The ends of all cables shall be sealed immediately. In case of PVC cables suitable moisture seal tape shall be used for this purpose.

Cable laid in trenches in a single tier formation shall have a covering of clean, dry sand of not less 17 cms above the base cushion of sand before the protective cover is laid. In the case of vertical multi tier formation after the first cable has been laid, a sand cushion of 30 cms shall be provided over the initial bed before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have a sand cushion of 30 cms as stated above. The top most cable shall have final sand covering not less than 17 cms before the protective cover is laid.

Unless otherwise specified, the cables shall be protected by the second class bricks of not less 20 cms x 10 cms x 10 cms (nominal size) protection covers placed on top of the sand (bricks to be laid breadth wise) for the full length of the cable. Where more than one cable is to be laid in the same trench, this protective covering shall cover all the cables and project at 5 cm. over the sides of the end cables. The trenches shall be taken back filled with excavated earth free from stones or other sharp edge debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30 cm, unless otherwise specified.

Route Marker

Cable route marker marked "Cable" shall be provided alongwith the route of the cable and location of loops. The route markers shall be of tapered concrete slab of 60 x 60cm at bottom and 50 x 50cm at top having a thickness of 10cm. Cable marker shall be mounted parallel to and 50cm away from the edge of the trench.

iii) Cables in indoor trenches

Cables shall be laid in indoor trenches wherever specified. The trench shall be made of brick masonry with smooth cement mortar finish with suitable removable covers (i.e. precasted slabs or chequered plates). The dimensions of the trenches shall be determined depending upon the maximum number of cables that is expected to be accommodated and can be conveniently laid. Cables shall be arranged in tier formation in trenches and if necessary, cables may be fixed with clamps. Suitable clamps, hooks and saddles shall be used for securing the cables in position. Spacing between the cables shall not be less than 15 cm centre to centre. Wherever specified, trenches shall be filled with fine sand and covered with RCC or steel chequered trench covers.

iv) Cable on Trays/Racks

a) Cable shall be laid on cable trays/racks wherever specified. Cable racks/trays shall be of ladder, trough or channel design suitable for the purpose. The nominal depth of the trays/racks shall be 150 mm. The width of the trays shall be made of steel or aluminium. The trays/racks shall be completed with end plates, tees, elbows, risers, and all necessary hardware, steel trays shall be hot dip galvanized. Cable trays shall be erected properly to present a neat and clean appearance. Suitable cleats or saddles made of aluminium strips with PVC covering shall be used for securing the cables to the cable trays. The cable trays shall comply with the following requirements :

b) The tray shall have suitable strength and rigidity to provide adequate support for all contained cables.

c) It shall not present sharp edges, burrs or projections injurious to the insulation of wiring/cables.

d) If made of metal, it shall be adequately protected against corrosion or shall be made of

e) It shall have side rails or equivalent structural members.
f) It shall include fittings or other suitable means for changes in direction and elevation of runs.

Installation

1. Cable trays shall be installed as a complete system. Trays shall be supported properly from the building structure. The entire cable tray system shall be rigid.
2. Each run of the cable tray shall be completed before the installation of cables.
3. In portions where additional protection is required, non combustible covers/enclosures shall be used.
4. Cable trays shall be exposed and accessible.
5. Where cables of different system are installed on the same cable tray, non combustible, solid barriers shall be used for segregating the cables.
6. Cable trays shall be grounded by two nos, earth continuity wires. Cable trays shall not be used as equipment grounding conductors.
Jointing and termination's

Cable jointing shall be done as per the recommendations of the cable manufacturer. All jointing work shall be done only by qualified/licensed cable jointer.

All jointing pits shall be of sufficient dimensions as to allow easy and comfortable working.

Jointing materials and accessories like conductor, ferrules, solder, flex, insulating and protective tapes, filling compound, jointing box etc. of right quality and correct sizes, confirming to relevant Indian Standards.
Each termination's shall be carried out using brass compression glands and cable sockets. Hydraulic crimping tool hall be used for making the end termination's. Cable gland shall be bonded to the earth by using suitable size copper wire/tape.

9.0 TESTING

a) Cable jointing shall be tested at factory as per the requirements of latest IS amendment upto date. The tests shall incorporate routine tests, type tests and acceptance tests.
b) Cable shall be tested at site after installation and the results shall be submitted to the Project Manager.
c) Insulation resistance between conductors and neutral and conductors and earth.
d) Pressure test for 15 minutes.

L) EXTERNAL LIGHTING:

The specifications covers the supply, installation, testing and commissioning of the following items (as specified in BOQ):
i) Street/Boundary lighting poles complete with all accessories e.g. looping box, clamps MCBs and required hardwares etc.
ii) Street/boundary lighting fixtures complete with all accessories e.g lamps, holders, choke,

upto terminal box etc.
iii) Wiring of street light fixtures.
iv) Cable laying, earthing and inter connection. G.I. pipes for cable entry to looping box.
v) Foundation of poles and erection.
vi) All the items should be tested and installed as per the latest Indian standards specifications and all the sundry items such as clamps, bolts, nuts, racks, support miscellaneous wiring etc., required to make the installation complete shall be taken care while quoting the major items.

a) Steel Tubular pole

The poles for street lighting purpose shall be complete in all respects and shall confirm to latest IS unless otherwise specified. All poles shall be complete with base plate of 400 mm x 400 mm x 10 mm thick welded to bottom. The poles shall be provided terminal box for looping in and looping out of cables and shall consists MCB as specified. The looping box shall be suitable for outdoor installation and complete with all hardwares such as clamp, bolts, earthing studs, lockable door etc. and shall be paint also in the same manner as specified for poles. The poles shall be provided with two numbers of GI pipes of suitable dia for cable entry as shown in drawing. The poles shall be painted with two coats of red oxide primer on both outside and the portion of the pole below the ground before erection and two coats of aluminium paint of approved shade after erection over the exposed portion.

b) Erection of pole

While loading, transporting, unloading and erecting the poles care shall be taken so that the poles do not get bent. Out of shape and where necessary such defects shall be rectified before the poles are erected in position. The poles shall be erected in plumb line and correct level as indicated in the drawing and to the satisfaction of the Engineer-in-charge. They shall be kept in this position with the help of manila ropes until the foundation are constructed (for a minimum period of 10 days) and the back filling is complete. Foundation shall be made with reinforced cement concrete (1:2:4) and not less than 200 mm thick all round. The pole base plate shall be fixed over 150 mm thick concrete bed. Foundation shall be continued upto 300 mm or more above ground level as per location of the pole to avoid ingress of water logging etc. The foundation shall be tapered suitably into a collar. The excavated portion shall be filled back with earth and consolidated. The cement concrete foundations shall be cured properly by covering the same with water soaked or moist gunny bags at least two weeks before loading the pole.

c) Erection of light fixtures

Each light fixture shall be connected to the supply through MCB of a suitable rating mounted in the looping box. The fitting shall be fixed to the pole properly and securely.

d) Wiring of light fixtures

The wiring of lighting fixtures from terminal block by means of 2.5 Sq.mm PVC insulated two core copper conductor through a suitable rated MCB and neutral. Cost of two core connecting cable from junction box to lighting fixture and earth wire complete with connections are included in the quoted rate.

e) Cabling works

All cable installation work shall be done as per relevant clauses of section cable work.

f) Tests

Before handing over the installation, tests on all fittings and cables shall be carried out as per IS specification.

The tests shall include:
- Meggar test
- Continuity test
- Polarity test and phase sequence test

M) EARTHING

1.0 GENERAL

This section covers the general arrangement of the earthing, i.e. all non-current carrying metal parts of the electrical installation shall be earthed as per latest IS code and general specifications for electrical works (part-1, internal) of CPWD specifications. All metal conduits, trunkings, cable sheaths, switchgear, distribution boards, meters, light fixtures, fans and all other metal parts forming part of the work shall be bonded together and connected by two separate and distinct conductors to earth electrodes. Earthing shall also be in conformity with the provisions of Rule 32, 61, 62, 67 and 88 of IER 1956. The earth electrode shall not be situated less than 1.5 mtr.

2.0 EARTHING SYSTEMS

It shall comprise of earth electrodes, earth strips, earth continuity conductor and all earthing conductors shall be of high conductivity copper, GI or aluminium and shall be protected against mechanical damage and corrosion. The size of earth conductors shall not be less than half that of the largest current carrying conductor. The connection of earth continuity conductors of earth bus and earth electrodes shall be strong and sound and shall be rigidly fixed to the walls, cable trenches, cable trays or conduits and cable by using suitable clamps made of non ferrous metals.

3.0 EARTHING ELECTRODES

Earthing electrodes shall be designed as per the requirement of latest IS codes. The number and size of earth electrodes shall be calculated so that under fault conditions no electrode is loaded above its maximum permissible current density. The resistance of earth electrode shall be as low as possible, the maximum allowable value being one ohm.
Earthing electrodes of either plate type or pipe type may be adopted. The choice of plate or pipe electrode shall be decided according to the anticipated fault level of the network and local soil conditions. Generally, plate electrodes shall be used for substations and large medium voltage network and pipe electrodes for small medium voltage network and installations.

3.1 Location of Earth Electrodes

Normally on earth electrode shall not be situated less than 1.5 m from any building. Care shall be taken that the excavation for earth electrode may not effect the column footings or foundation of the buildings. In such cases electrodes may be further away from the building. The location of the earth electrode will be such where the soil has reasonable chance of remaining moist. As far as possible, entrances, pavements and road ways, are to be definitely avoided for locating earth electrode.

3.2 Water Arrangement

Method of watering arrangement shall comply with CPWD General Specifications.

3.3 Plate Electrode

Plate electrodes shall be made of GI plate of 6 mm thick and 60x60 cm. size. The plate shall be buried vertically in ground at depth of not less than 3.5 metres to the top of the plate, the plate being encased in charcoal to a thickness of 15 cm. all round. It is preferable to bury the electrode to a depth where sub-soil water is present. Earth leads to the electrode shall be laid in a GI pipe and connected to the plate electrode with GI bolts, nuts and washers. A GI pipe of not less than 19 mm dia shall be placed vertically over the plate and terminated in a funnel at 5 cm. above ground. The funnel shall be provided with a wire mesh. The funnel shall be enclosed in masonry chamber of 100 x 50 cm. dimensions. The chamber shall be provided with CI frame cover of 100 x 50 cm size. The earth station shall also be provided with a suitable permanent identification label/tag.

Note : If copper plate is used it shall be of 3mm thickness.

3.4 Pipe electrode shall comprise of a 2.5 Mtr. long 40 mm dia GI pipe buried vertically in a pit of 35 x 35 cm size and filled with alternate layers of charcoal, salt and river sand and connected at the top to a GI pipe of 19 mm, 1 Mtr. long with a funnel at the other end, 5 cm above the ground. The earth lead shall be properly fixed to the pipe electrode with brass bolts, nuts and washers. The funnel and earth lead connections shall be enclosed in a masonry chamber of 30 x 30 x 30 cm. dimensions. The chamber shall be provided with a CI frame and CI cover. Proper permanent identification tag/label shall be provided for each electrode.

4.0 INSTALLATION

4.1 All joints shall be reverted and sweated. Joints in the earth bar shall be bolted and the joints faces tinned. Where the diameter of the bolt for connecting earth bar to aparatus exceeds one quarter of the width of the earth bar, the connection to the bolt shall be made with a wider piece of flange of copper jointed to earth bar. These shall be tinned at the point of connection and special care taken to ensure a permanent low resistance contact to iron or steel. All steel bolts, nuts, washers, etc shall be cadmium plated. Main earth bars shall be spaced sufficiently away from the surface to which they are fixed, such as walls or the side of trenches to allow for easy connections. Copper earth bars shall not be fixed by ferrous fittings. The earthing shall be suitably protected from mechanical injury by galvanized iron within ground shall be buried at least 60 cm deep. The earthing lead shall be securely bolted and soldered to the plate or pipe as the case may be. In the case of the plate, the lead shall be connected by means of cable socket with two bolts and nuts. All washers shall be of the same materials as the plate or pipe. All iron bolts, nuts and washers shall be galvanized.

4.2 Method of Installation of watering arrangement

In the case of plate earth electrode a watering pipe of 20 mm dia of medium class GI pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top for watering the pit. In case of pipe earth electrode a 40 mm x 20 mm reducer shall be used for accessing the funnel. The watering funnel attachment shall be housed in masonary enclosure of not less than 30 cm x 30 cm x 30 cm. A cast iron cover having locking arrangement shall be suitably embedded in the masonary enclosure.

5.0 PRECAUTIONS

5.1 Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after passages of fault currents.
5.2 Joints shall be soldered, tinned and double riveted. All the joints shall be mechanically and electrically continuous and effective. Joints shall be provided against corrosion.
5.3 The earthing lead from electrode onwards shall be suitably protected from mechanical injury by a 15 mm dia GI pipe in case of wire and by 40 mm dia medium class GI pipe in case of strips. Portion of this protection pipe within the ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floor to adequate depth.

6.0 TESTING

6.1 On the completion of the entire installation, the following tests shall be conducted and no earth electrode shall have ohmic resistance of more than 2 ohm and in rocky soil not more than 3 ohms.
a) Earth resistance of electrodes
b) Impedance of earth continuity conductors as per IEE regulations.
c) Effectiveness of earthing as per IEE regulations.

6.2 All meters, instruments and labour required for the tests shall be provided by the contractor. The test results shall be submitted in triplicate to the Architects for approval.

N) LIGHTNING PROTECTION SYSTEM

1 STANDARDS

The latest Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of the Contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall apply. Wherever appropriate Indian Standards are not available relevant British and/or IEC Standards shall be applicable.

2 GENERAL

The Lightning Protective System shall comprise of Air Terminations, Down Conductors, Earth Terminations etc as required. The System shall preferably use the same conducting material throughout and will comply to the detailed specifications detailed hereinafter.
The entire lightning system should be mechanically strong to withstand the mechanical forces produced in case of a lightning stroke.

3 MATERIALS

The materials of which the protective system is composed shall be resistant to corrosion or be adequately protected against corrosion. The material shall be as specified in the Schedule of Quantities and shall comply to the following requirements:
a) Copper - When solid or stranded copper wire is used it shall be of the grade ordinarily required
for commercial electrical work generally designated as being of 98% conductivity when annealed, conforming to Indian Standard Specifications.
b) Galvanised Steel - Galvanised steel used shall be thoroughly protected against corrosion by hot
dipped Zinc coating. The material coating shall withstand the test specified in latest IS code.
c) The strips to be used shall be in maximum lengths available as manufactured normally avoiding
unnecessary joints.

4 AIR TERMINATIONS

4.1 Vertical Air Terminations

Vertical air terminations shall comprise of finials made of 25 mm dia GI tube with single or multiple prongs at the top. Vertical terminations where provided shall project 30 cms above the project salient point or net work on which it is fixed.
4.2 Horizontal Air Terminations

Horizontal air terminations should be so interconnected that no part of the roof is more than 9 m away from the nearest horizontal conductor. For a flat roof horizontal air termination along the outer perimeter of the roof is to be used. For a roof of larger area a net work of parallel horizontal conductors shall be installed. Horizontal air terminations should be coursed along contours such as ridges, parapets and edges of the flat roofs and where necessary over flat surfaces in such a way as to join each air termination to the rest and should themselves form a closed network.

All metallic finials, chimneys, duct, vent pipes, railings, gutters, and the like on or above the main surface of the roof of the structure should be bonded to and form part of the air termination network.

5 DOWN CONDUCTORS

The Down Conductors shall be of material as specified in the Schedule of Quantities. These shall be distributed around the outside walls of the structure and shall preferable be run along the corners and other projections. Lift shafts shall not be used for fixing the Down Conductors. The routing of the Down Conductors shall be such that it is accessible for inspection, testing and maintenance.

6 TESTING JOINTS AND BENDS

The lightning protective system should have as few joints in it as possible.
Wherever joints in the down conductor above ground level are necessary they shall be mechanically and electrically effective.
In the down conductor below ground level there shall be no joints.
The joints may be clamped, screwed, bolted, rivetted, sweated braced or welded. Bolted joints should be used on test points or on bonds to existing metal.
Each down conductor should be provided with a testing joint in a position convenient for testing but inaccessible for interference.

7 FASTENERS

Conductors shall be securely attached to the building by fasteners which shall be substantial in construction, not subject to breakage.
These shall be of galvanised steel or other suitable materials with suitable precautions to avoid corrosion.
The method and nature of the fixing should be simple, solid and permanent. The lightning conductors shall be secured at not more than 1.20 m apart for horizontal run and 1.00 m for vertical run.

8 EARTH TERMINATION

Each down conductor shall have an independent earth termination and all earth terminations should be interconnected.

9 EARTH ELECTRODES

Earth electrodes shall be constructed and installed as laid down in the latest IS code.

9.1 Plate Earth Electrode

The plate electrodes shall be of Copper or G.I. as called for in the Bill of Quantities. The minimum dimensions of the electrode shall be G.I. 600 mm x 600 mm x 6 m thick and for Copper 600 mm x 600 mm x 3 mm.

The electrode shall be buried in ground with its face vertical and top not less than 3 m below ground level.

9.2 Earth Electrode Pit

In the case of plate earth electrode, a watering pipe of 20 mm dia of medium class G.I. Pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided at the top of this pipe for watering the earth. The watering funnel attachment shall be housed in masonry enclosure of not less than 300 x 300 x 300 mm. A cast iron/M.S. frame with cover having locking arrangement shall be suitably embedded in the masonry enclosure.

9.3 Location Of Earth Electrode

The following guidelines shall be followed for locating the earth electrodes

- An earth electrode shall not be situated less than 2 metres from any building.
- The excavations for electrode shall not affect the column footings or foundations of the buildings. In such cases electrode may be further away from the building.
- The location of the earth electrode shall be such where the soil has reasonable chance of remaining moist, as far as possible.
- Entrances, pavements and road ways shall not be used for locating the earth electrode.

10 EARTH RESISTANCE

The whole of the lightning protective system should have a combined resistance to earth not exceeding 10 ohms before any bonding has been effected to metal or on a surface or to surface below ground.

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	Description	Unit	Qty	Rate (Rs.)		Amount (Rs.)
				(In Figures)	(in Words)	
Sub-HEAD-I: Rectification/Rework of Existing System						
A	**DISMANTLING AND REFIXING**					
1	Removing of existing Modular plate fittings, storage and re-Fixing of the same after completion of fresh conduiting and wiring work.					
a)	5/6 A switch	Each	331			
b)	15/16 A switch	Each	78			
c)	3 pin 5/6 A socket outlet	Each	331			
d)	6 pin 15/16 A socket outlet	Each	78			
e)	Telephone socket outlet	Each	2			
f)	TV antenna socket outlet	Each	3			
g)	Bell push	Each	2			
h)	Electrical Fan regulator	Each	75			
2	Removing of existing Light fittings, storage and re-Fixing of the same after completion of fresh conduiting and wiring work.	Each	250			
3	Dismantling of Existing conduiting and wiring works in the rooms or as directed by the engineer in charge, handing over the material to the engineer in charge.	lumpsum	1			
B	**CIRCUIT CUM POINT WIRING**					
1	Wiring for **light point/Ceiling/Wall fan point /exhaust fan/call bell point** with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit with modular switch modular plate suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc.as required.					
a)	Group A	Point	430			
	REDUCTION RATES OF FOLLOWING ITEMS					

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	**Description**	**Unit**	**Qty**	**Rate (Rs.)**		**Amount (Rs.)**
				(In Figures)	**(in Words)**	
2	**Reduction rates** of following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required. This material is existing at site and will be reused as part of point wiring.					
a)	5/6 A switch	Each	**-370**			
3	**Reduction** of following Modular base & cover plate on existing modular metal boxes etc. as required. This material is existing at site and will be reused as part of point wiring.					
a)	1or 2 module	Each	**-40**			
b)	3 Module	Each	**-20**			
c)	4 Module	Each	**-20**			
d)	6 Module	Each	**-58**			
e)	8 Module	Each	**-10**			
f)	12 Module	Each	**-4**			
4	Wiring for **twin control light point** with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface/ recessed **PVC** conduit with 2 way modular switch modular plate suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc.as required.	Point	2			
5	Wiring for light/ power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit along with 1 No 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	Mtr.	1500			
6	Wiring for light/ power plug with 4X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit along with 2 Nos 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	Mtr.	300			
7	Wiring for circuit/ sub main wiring along with earth wire with the following sizes of PVC insulated copper conductor, Single core cable in surface/ recessed PVC conduit as required					

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	Description	Unit	Qty	Rate (Rs.)		Amount (Rs.)
				(In Figures)	(in Words)	
a)	2x 2.5 sqmm+ 1x 2.5 sqmm earth wire	Mtr.	1140			
b)	2x 4 sqmm+ 1x 4 sqmm earth wire	Mtr.	200			
c)	2x 6 sqmm+ 1x 6 sqmm earth wire	Mtr.	200			
d)	2x 10 sqmm+ 1x 6 sqmm earth wire	Mtr.	200			
e)	4x 4 sqmm+ 2x 4 sqmm earth wire	Mtr.	100			
f)	4x 6 sqmm+ 2x 6 sqmm earth wire	Mtr.	100			
g)	4x 10 sqmm+ 2x 6 sqmm earth wire	Mtr.	200			
h)	4x 16 sqmm+ 2x 6 sqmm earth wire	Mtr.	50			
8	Rewiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable and 1.5 sq.mm FRLS PVC insulated copper conductor single core cable as earth wire in existing surface/recessed steel/PVC conduit including dismantling as required.					
a)	GROUP A	Point	50			
9	Rewiring for twin control light point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable and 1.5 sq.mm FRLS PVC insulated copper conductor single core cable as earth wire in existing surface/ recessed steel/PVC conduit including dismantling as required.	Point	8			
10	Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface/recessed steel/ PVC conduit as required.					
a)	1 x 1.5 sq. mm	Mtr.	200			
b)	2 x 1.5 sq. mm	Mtr.	300			
c)	3 x 1.5 sq. mm	Mtr.	40			

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	Description	Unit	Qty	Rate (Rs.)		Amount (Rs.)
				(In Figures)	(in Words)	
d)	2 x 2.5 sq. mm	Mtr.	200			
e)	3 x 2.5 sq. mm	Mtr.	50			
f)	2 x 4 sq. mm	Mtr.	50			
g)	3 x 4 sq. mm	Mtr.	50			
11	**Telephone wiring in existing conduiting**: Supply & drawing following pair, 0.5 sq.mm FRLS PVC insulated copper conductor, unarmoured telephone cable in existing surface/ recessed steel/ PVC conduit as required.					
a)	2 pair	Mtr.	60			
b)	4 pair	Mtr.	10			
12	Supply & fixing of following sizes of **PVC** conduit along with accessories in surface / recessed including cutting the wall & making good the same in case of recessed conduit as required.					
a)	20 mm dia.	Mtr.	100			
b)	25 mm dia.	Mtr.	100			
c)	32 mm dia.	Mtr.	50			
d)	40 mm dia.	Mtr.	50			
e)	50 mm dia.	Mtr.	50			
13	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.					
a)	5/6 A switch	Each	10			
b)	15/16 A switch	Each	6			
c)	3 pin 5/6 A socket outlet	Each	10			

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	**Description**	**Unit**	**Qty**	**Rate (Rs.)**		**Amount (Rs.)**
				(In Figures)	**(in Words)**	
d)	6 pin 15/16 A socket outlet	Each	6			
e)	Telephone socket outlet	Each	5			
f)	TV antenna socket outlet	Each	2			
g)	Bell push	Each	2			
14	Supplying and fixing two module of Stepped type electronic fan regulator on the existing modular plate & switch box including connections but excluding modular plate etc. as reqd.	Each	5			
15	Supplying and fixing of modular Blanking plate on the existing modular plate & switch box including connections but excluding modular plate etc. as reqd.	Each	5			
16	Supply and fixing of following size/ modules, GI box along with modular base & cover plate for modular switch/ regulator in recess, including connection as required.					
a)	1or 2 module (75mmx 75mm)	Each	10			
b)	3 Module (100 mmX75 mm)	Each	8			
c)	4 Module (125 mmX75 mm)	Each	5			
d)	6 Module (200 mmX75 mm)	Each	3			
e)	8 Module (125 mmX125 mm)	Each	2			
f)	12 Module (200 mmX150 mm)	Each	1			
17	Supplying and fixing following Modular base & cover plate on existing modular metal boxes etc. as required.					
a)	1or 2 module	Each	10			
b)	3 Module	Each	8			
c)	4 Module	Each	6			

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	**Description**	**Unit**	**Qty**	**Rate (Rs.)**		**Amount (Rs.)**
				(In Figures)	**(in Words)**	
d)	6 Module	Each	5			
e)	8 Module	Each	4			
f)	12 Module	Each	2			
18	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch, connections etc. as required.	Each	20			
19	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5/6 A & 15/16 A modular socket outlet and 15/16 A modular switch, connections etc. as required.	Each	10			
20	Supply and fixing of 3 Pin ,5amp ceiling rose on the existing junction box /wooden block including connection etc as required.	Each	20			
21	Supply and fixing brass batten / angle holder including connection etc. as required.	Each	10			
22	Installation, testing & commissioning of pre-wired, fluorescent fitting / compact fluoroscent fitting of all type, complete with all accessories & tubes etc. directly on ceiling / wall, including connection with 1.5 sq.mm. FRls PVC insulated, copper condutor, single core cable and earthing etc. as required.	Each	425			
23	Installation, testing and commissioning of pre-wired, fluorescent fitting/ compact fluorescent fitting of all types, with all accessories and tube etc., including supplying and fixing ball and socket arrangement, 2 no. down rods of 20 mm dia X 1.6 mm thick steel conduit upto 30 cm length, painting and wiring the down rods and connection with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable and earthing etc as required.	Each	20			
24	Providing and fixing extra conduit down rod of 20 mm dia, 2 X 10 cm length wiring with 2 X 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable including painting etc. as required. (Note : More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)	Each	50			

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	Description	Unit	Qty	Rate (Rs.)		Amount (Rs.)
				(In Figures)	(in Words)	
25	Installation, testing & commissioning of ceiling fan including wiring the down rods of standard length (upto 30 cm) with 1.5 sq.mm FRLS PVC insulated, copper conductor, single core cable, including providing and fixing phenolic laminated sheet cover on the fan box etc. as reqd.	Each	75			
26	Supplying and fixing extra down rod of 10 cm length G.I. pipe ,15 mm dia, heavy gauge including painting etc. as required. (Note : More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)	Each	50			
27	Supplying and fixing extra conduit down rod of 20 cm length G.I. pipe 15 mm dia, heavy gauge including painting etc. as required. (Note : More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)	Each	50			
28	Numbering of ceiling fan/ exhaust fan/ fluorescent fittings as required.	Each	300			
29	Installation of Exhaust/Wall fan in the existing opening , including making the hole to suit the size of the above fan, making good the damage connection, testing commissioning etc. as required.					
	Upto 450 mm sweep	Each	9			
30	S/F DLP UPVC trunking compartment with cover clip on separates partition left right top internal angle, flat angle, raise function, flat function cover to body joints mosaic clip & support from mosaic isolation bracket 2 mm thick plastic. (Legrand)					
a)	105 x 50 mm with all accessories	Metre	200			
b)	150 x 50 mm with all accessories	Metre	200			
31	Supplying and Installing following size of perforated pre-painted M.S. cable trays with perforation not more than 17.5% in convinient sections,jointed with connectors, suspended from the ceiling with M.S suspenders including bolts and nuts, painting suspenders etc as required.					
a)	100 mm width x 50 mm depth x 1.6 mm thickness	Metre	50			
b)	150 mm width x 50 mm depth x 1.6 mm thickness	Metre	30			

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	**Description**	**Unit**	**Qty**	**Rate (Rs.)**		**Amount (Rs.)**
				(In Figures)	**(in Words)**	
c)	300 mm width x 50 mm depth x 1.6 mm thickness	Metre	25			
32	Supplying and Installing following size of perforated pre-painted M.S. cable trays bends with perforation not more than 17.5% in convinient sections,jointed with connectors, suspended from the ceiling with M.S suspenders including bolts and nuts, painting suspenders etc as required.					
a)	100 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
b)	150 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
c)	300 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
33	Supplying and Installing following size of perforated pre-painted M.S. cable trays reducers with perforation not more than 17.5% in convinient sections,jointed with connectors, suspended from the ceiling with M.S suspenders including bolts and nuts, painting suspenders etc as required.					
a)	100 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
b)	150 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
c)	300 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
34	Supplying and Installing following size of perforated pre-painted M.S. cable trays tees with perforation not more than 17.5% in convinient sections,jointed with connectors, suspended from the ceiling with M.S suspenders including bolts and nuts, painting suspenders etc as required.					
a)	100 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
b)	150 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
c)	300 mm width x 50 mm depth x 1.6 mm thickness	Each	1			

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	**Description**	**Unit**	**Qty**	**Rate (Rs.)**		**Amount (Rs.)**
				(In Figures)	**(in Words)**	
35	Supplying and Installing following size of perforated pre-painted M.S. cable trays cross members with perforation not more than 17.5% in convinient sections,jointed with connectors, suspended from the ceiling with M.S suspenders including bolts and nuts, painting suspenders etc as required.					
a)	100 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
b)	150 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
c)	300 mm width x 50 mm depth x 1.6 mm thickness	Each	1			
36	Supplying & Fixing 20 amps,240 volts,SPN industrial type Socket outlet, with 2 pole and earth, metal enclosed plug top along with 20 amps "C" curve, SP, MCB, in sheet steel enclosure, on surface and recess, with chained metal cover for the socket outlet and complete with connections, testing and commissioning etc. as required.	Each	10			
37	**TV cable in existing conduiting**: Supply & drawing co-axial TV cable RG-6 grade, 0.7 mm solid copper conductor PE insulated, shielded with fine tinned copper braid and protected with PVC sheath in existing surface/ recessed steel/ PVC conduit as required.	Mtrs.	150			
38	Supplying and fixing of modular TV antenna socket outlet on the existing Modular plate & switch including connection but excluding modular plate etc. as required.	Each	2			
39	Supply & fixing of **Call bell/ Buzzer s**uitable for A.C. single phase, 230 volts complete as required	Each	2			
40	Providing & fixing of M.V. danger notice plate of 200 mm x 150 mm, made of mild steel, at least 2 mm thick, and vitreous enamelled white on both sides, and with inscription in single red colour on front side as required.	Each	5			
41	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	each	2			
42	Providing and fixing 25 mm X 5 mm G.I. strip in 40 mm dia G.I. pipe from earth electrode including connection with G.I. nut, bolt, spring, washer excavation and re-filling etc. as required.	meter	15			

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	**Description**	**Unit**	**Qty**	**Rate (Rs.)**		**Amount (Rs.)**
				(In Figures)	**(in Words)**	
43	Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	meter	150			
	TOTAL: Sub-Head-I (Rs.)					
Sub-Head-II : FITTINGS & FIXTURES						
1	Supply. Installation, testing & commissioning of the following fixtures complete in all respects including chokes, starters, tube holders, reflector assembly, lamps etc.					
a)	12 Watt Recessed LED Light Fitting (CAT No. HAVELLS_EDGEPRO SQUARE : EDGEPROSQDLR12WLED840S or equivalent)	Each	75			
b)	10 Watt Surface LED Light Fitting (CAT No. HAVELLS_Integra Neo (Surface) : INTEGRANEOSURFA CEDLS10WLED840S or equivalent)	Each	50			
c)	20 Watt Surface LED tube light Fitting (CAT No. HAVELLS_ENDURA LINEAR NEO : ENDURALINEARNEOBS20WLED865SPCWH or equivalent)	Each	16			
	TOTAL: Sub-Head-II (Rs.)					
Sub-Head-III : CCTV SYSTEM						
1	**Dome Camera**					
	Supply, installation, testing and commissioning of IP based, 4 MP, FULL HD WDR IR DOME CAMERA - 30 MTRS, colour indoor verifical dome camera, 3.6 MM FIXED LENS, 1/3 ", 4 Mega Pixel PS CMOS Image Sensor, WDR (120 dB), Day/ Night (ICR), IR Range of 30 Mtrs, IP67 and all ancillary equipments and all accessories.	Each	2			
	CP PLUS MAKE - UNC DD40L3-D OR EQUIVALENT IN OTHER MAKES LIKE SONY/ HONEYWELL.					
2	**Bullet cameras**					
	Supply, installation, testing and commissioning of IP based, 4 MP, FULL HD WDR IR bullet CAMERA - 40 MTRS, colour indoor verifical dome camera, 3.6 MM FIXED LENS, 1/3 ", 4 Mega Pixel PS CMOS Image Sensor, WDR (120 dB), Day/ Night (ICR), IR Range of 40 Mtrs, IP67 and all ancillary equipments and all accessories.	Each	7			
	CP PLUS MAKE - UNC TD40L4-D OR EQUIVALENT IN OTHER MAKES LIKE SONY/ HONEYWELL.					

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	**Description**	**Unit**	**Qty**	**Rate (Rs.)**		**Amount (Rs.)**
				(In Figures)	**(in Words)**	
	Network Video Recorder					
3	Supply, Installation, Testing and Commisioning of 16 CHANNEL NETWORK VIDEO RECORDER, H.264/MJPEG dual codec decoding,Max 256 Mbps incoming bandwidth, HDMI/ VGA simulation video output, support 8 SATA HDD's upto 32 TB, 1 ESATA up to 16 TB, supports multi brand network cameras. Each NVR shall have a storage capacity so as to record a backup for 15 days at 4 CIF @ 25FPS.NVR should have system expandibility feature of at least 20% of current requirement, redundant fan and power supplies, outputs TCPIP network feature & server software monitor outputs. The NVR should be networkable via IP protocol & should be able to connect to a web based system for remote viewing via web system. Vendor should submit the storage / HDD Calculation.	Each	1			
	CP PLUS MAKE - UNR 7364R8-R OR EQUIVALENT IN OTHER MAKES LIKE SONY/ HONEYWELL.					
4	Supply, Installation, Testing and commisioning of 32" inches LCD monitor	Each	1			
5	Supplying, drawing, connecting & testing of 4 pair CAT-6 (E) wire for Data Outlet in PVC conduit	Mtr.	440			
	TOTAL: Sub-Head-III (Rs.)					
Sub-Head-IV : LIGHTNING ARRESTOR SYSTEM						
1	Supply, erection, testing & commissioning of ESE Stormaster type Lightning Protection complete with the Lightning Air Terminal - Configured as a Spheroid which is comprised of separate electrically isolated 4 panels surrounding an Earthed Central Finial. The Insulation material used to electrically isolate the panels shall be comprised of a base polymer which provides high Ozone & UV resistance with a di-electric strength of 24-38 KV/mm tested as per NFC 17-102 & IEC 60-1:1989. The ESE terminal shall be tested & certified by CPRI (Central Power Research Institute, Govt of India) for the Impulse current of 45 KA (8/20 micro sec) with 5 positive & 5 negative impulse. The terminal shall offer a protection radius of 50-68 Mtrs with the Level 1 (High) protection & preferably to be mounted on roof top & centre of the building.	SET	1		-	

ELECTRICAL WORKS - BILL OF QUANTITIES						
S.No.	Description	Unit	Qty	Rate (Rs.)		Amount (Rs.)
				(In Figures)	(in Words)	
	TOTAL: Sub-Head-IV (Rs.)					

Note: All rates quoted shall be for complete finished work including cost of all labor, material, scaffolding, tools & tackles, lead lifts etc. and inclusive of all taxes and duties, octroy, royalties etc, excluding GST. Only GST shall be paid extra as applicable. The material used shall be duly approved by the consultants before incorporation in the actual works. Before initiating and after completion of the above work following test are to be conducted for which no extra/additional amount will be claimed/paid by/to the bidder detailed as under:

1. Insutation resistance test
2. Polarity test of switch
3. Earth continuity test
4. Earth electrode resistance test

SUMMARY SHEET OF ELECTRICAL WORKS			
	Description		Amount (Rs.)
I	Sub-HEAD-I: Rectification/Rework of Existing System		
II	Sub-Head-II : FITTINGS & FIXTURES		
III	Sub-Head-III : CCTV SYSTEM		
IV	Sub-Head-IV : LIGHTNING ARRESTOR SYSTEM		
	GRAND TOTAL (Rs.)		

	LIST OF APPROVED MAKES : ELECTRICAL WORKS	
S.No	**ITEM**	**MANUFACTURE**
1	HV/MV/LV/ELV CABLE-XLPE INSULATED AS PER	HAVELLS
	IS:7098 AND COPPER WIRES AS PER IS:694/1990	POLYCAB
		KEI
		PARAMOUNT
2	UPS	Numeric
		Delta
3	BATTERIES FOR UPS	Exide
		Amarraja (Quanta)
4	1.1KV COPPER WIRES AS PER IS:694/1990	PolyCab
	AND T.V. CO-AXIAL CABLE	HAVELLS
		PARAMOUNT
		GREATWHITE ELECTRICAL
5	HV CAPACITOR/MV CAPACITOR/ APFCR/REACTOR	Schneider
		ABB
		EPCOS
6	CURRENT/POTENTIAL TRANSFORMERS	KAPPA
	NOTE:- FOR HT PANEL, CT, PT, SHALL BE AS PER	Minilec
	STANDARD FITMENT OF PANEL MANUFACATURES	PRAGATI
		ELMAX
		PRECISE
		TRANSTECH
7	BATTERIES CHARGERS	STATE ON,
		VOLTAMP,
		LOGICSTAT
8	MCB/ELCB/DB/RCCB/MPCB	LEGRAND
	Industrail Sockets-Sheet Metal Clad	SCHENIEDER
		HAGER
		ABB
9	CT SHORT LINK / NEUTRAL LINK/	ELMAX
	TERMINAL BLOCK	TOSHIBA
		FTC
		PHOENIX
		CONNECT
10	SELECTOR SWITCHES / ROTARY SWITCHES	LEGRAND
		SALZER
		C & S
11	TIME SWITCHES	L & T
		MDS
		SCHENIEDER
		MINILEC

	LIST OF APPROVED MAKES : ELECTRICAL WORKS	
S.No	**ITEM**	**MANUFACTURE**
12	LED TYPE INDICATING LAMPS , PUSH BUTTONS	L & T
		ABB
		SCHENIEDER
		KAYCEE
		C & S
		TEKNIK
		VAISHANO
13	PUSH BUTTONS ACTUATOS	L & T (ESBEE)
		ABB
		SCHENIEDER(MG)
		C & S
		MDS
14	RCC HUME PIPE	Pooja Cement Udyog
		Dynamic Concrete Products
		Jain Spun Pipe Co.
		Hindustan Pipe Co.
15	HV CABLE JOINTS	RAYCEM
	(indoor/outdoor)	MAHINDRA (M-SEAL)
		BIRLA 3M
16	CABLE TRAYS / RACEWAY	ERA Control System
		BEC
		Aditya Steel Industries
		Anubhav Power & Control
17	D.G.SETS SUPPLIER/MANUFACTURERS	SUDHIR
		CATERPILLER
		KIRLOSKAR
		STERLING & WILSON
		Cotton Greaves
18	LIGHT FIXTURES	BAJAJ
		HAVELLS
		EON
		PHILIPS
19	G.I. POLES AND ARMs.	BAJAJ
		PHILIPS
20	PVC CONDUIT & ACCESSORIES	BEC
		AKG
21	SWITCHES & SOCKET MODULAR TYPE	LEGRAND-ARETEOR
		SCHENIEDER-OPALE
		GREATWHITE ELECTRICAL
22	CRIMPING TYPE LUGS & THIMBLES	DOWELLS
		COMET
		ACTION

	LIST OF APPROVED MAKES : ELECTRICAL WORKS	
S.No	**ITEM**	**MANUFACTURE**
		ASIAN
23	CABLE GLANDS	
23A	BRASS CABLE GLANDS	DOWELLS
		COMMET
		POLYCAB
23B	PVC CABLE GLANDS	HAVELLS
		TRINITY
		LOTUS
24	FANs	BAJAJ
		CROMPTON GREAVES
		HAVELLS
		USHA
25	HDPE PIPE	Dura-Line
		REX
		BEC
26	M.S. CONDUIT & ACCESSARIES	BEC
		AKG
27	G.I. CONDUIT & ACCESSARIES	TATA
		BEC
28	PANEL COOLING FANS	Rexonard
		Rittal
		HAVELLS
		PHILIPS
29	RELAYs	MINILEC
		PROK DEVICES
		ASHIDA
		SAME MAKE OF SWITCHGEAR
30	SWITCHES & SOCKET PIANO TYPE	LEGRAND-ARETEOR
		SCHENIEDER-OPALE
		GREATWHITE ELECTRICAL
31	MULTIFUNCTION METERS/TVM	ENERSOL
	DOOR MOUNTED DUAL SOURCE ENERGY METERS	AMLT
		TRINITY
		SAME MAKE OF SWITCHGEAR
32	BASE MOUNTED WHOLE CURRENT	ENERSOL
	DUAL SOURCE ENERGY METERS	TRINITY
		SECURE
		ELMEASURE
33	LAMP & BALLAST	OSRAM
		PHILIPS

	LIST OF APPROVED MAKES : ELECTRICAL WORKS	
S.No	**ITEM**	**MANUFACTURE**
		HAVELLS
		BAJAJ
		HALOMAX
34	AIR CIRCUIT BREAKER (ACB)	Siemens (3WL)
	ACBs (Up to 50kA)	Schneider-MVS
		ABB(E-Max)
		L&T-Larsen & Toubro (C-POWER)
35	ACBs (above 50kA)	Siemens (3WL)
		Schneider-NW
		ABB(E-Max)
		L&T-Larsen & Toubro (U-POWER)
36	MULDED CASE CIRCUIT BREAKER (MCCB)	Siemesn-3VL
	Spreder Links & Extended Rotary Handle	L&T-Larsen & Toubro (D-SINE)
	(Same Make of Switchgears)	Schneider-NSX
		ABB (T-Max)
37	PLC	ABB(AC500)
		Siemens(S7400)
		Schneider(Quantum)
38	SOFT-STARTER/SFU/SDF/HRC FUSE	ABB
		SCHNEIDER
		SIEMENS
39	BY-PASS SWITCH	HAVELLS
		HPL-SOCOMEC
		C&S
40	CHANGE OVER SWITCH	L&T-Larsen & Toubro
		ABB
		C&S
41	THERMOPLASTIC/POLYSTYRENE BOX	HENSAL
	POLYCARBONATE ENCLOSURE	CLIPSAL
		TRINITY
42	Under Floor POP-UP- BOX	LEGRAND
		M.K.
		ANCHOR
43	Maintenance free chemical earthing	JNR Grounding System
		ENNOV INFRA SOLUTIONS (P) LTD.
		ASH GEL EARTHING ELECTRODE
		LPI
44	INVERTER	MICROTECH
		V-GUARD
		SU-KAM
		LUMINOUS

	LIST OF APPROVED MAKES : ELECTRICAL WORKS	
S.No	**ITEM**	**MANUFACTURE**
45	Fabrication Sheet	Tata Sheet
		Bhushan Steel
		Jindal Iron & Sheet
46	Aluminium Busbars	Hindalco
47	Cooper Bus-bars	RR Cooper
48	MV/LV PANEL & CAPACITOR FEBRICATOR	Sudhir Gensets Limited
		Risha Control Engineers Pvt. Ltd.
		CONTROL WELL SWITCHGEAR
		RST ELECTRICALS
49	FIRE ALARM SYSTEM	RAVEL
		AGNI
50	PA SYSTEM	BOSCH
51	CCTV SYSTEM	CP PLUS
		SONY
	Instruction to bidders:	
a.	**Submit catalogues/Data Sheets/Manuals with the offers.**	
b.	**Final choice of makes among the approved list shall rest with the Client / Project Managers / Architect / Consultants.**	
c.	**Produce test certificates for equipment/material supplied with bills for certification.**	
d.	**Submitals and sampels must be gotten approved before supply from Client / Project / Managers / Architect / Consultants.**	