

PROPOSED ELECTRICAL WORK



E- LOBBY & BRANCH

AT

**ROSE GARDEN BUILDING, VAKOLA PIPE LINE,
VAKOLA SANTACRUZ (E) MUMBAI.**

JOB PERIOD – 06 WEEKS

DATE OF ISSUE: - 07/05/2018 TO 28/05/2018

SUBMISSION OF TENDER: -28/05/2018 UPTO 3:00 PM

TECHNICAL BID

- :ARCHITECT: -

DILIP KULKARNI & ASSOCIATES

ARCHITECT, INTERIOR, LANDSCAPE DESIGNER & SURVEYOR.

5, Laxmi Building, Municipal Chawl, Ground Floor, Dr. Ambedkar Road, Near Jaihind Talkies,
Chinchpokli (E) Mumbai - 400 033.

Tel.: - 022 – 2283 5003 / 022 – 2202 1629 FAX: - 2202 7315

MOBILE: - Mr. Milind 9769401775/

E-MAIL – dkulkarniasso@gmail.com

NOTICE INVITING TENDER

Tender for **ELECTRICAL** Work at **BANK OF BARODA – E-LOBBY and Branch AT ROSE GARDEN BUILDING, VAKOLA PIPE LINE, VAKOLA SANTACRUZ (E) MUMBAI.**

Dear Sir,

The **BANK OF BARODA**, hereby invite you to tender on item rate basis for the **ELECTRICAL** Work for **BANK OF BARODA – E-LOBBY and Branch** at **GARDEN BUILDING, VAKOLA PIPE LINE, VAKOLA SANTACRUZ (E) MUMBAI.**

02. The tender document shall be downloaded from the bank's website – www.bankofbaroda.com.
03. Submission of tenders.
01. The tenders to be submitted in two separate envelopes, each sealed and clearly identified as to envelop number and contents as indicated below “**ELECTRICAL Work**” for **BANK OF BARODA – E-LOBBY** at **GROUND FLOOR, GARDEN BUILDING, VAKOLA PIPE LINE, VAKOLA SANTACRUZ (E) MUMBAI.**

Your Tender duly filled in and signed and sealed, should be addressed and hand delivered to **The Deputy General Manager – BANK OF BARODA, Mumbai Metro Central Region, 1st Floor, Kedy Shopping Arcade, 233-234 Belasis Road, Nagpada, Mumbai 400 008**
02. **MAHARASHTRA**, on or before **28/05/2018 upto 3:00 p.m.**
04. Envelop No.1 shall contain the following:
Form of tender
- 04a EARNEST MONEY DEPOSIT of **Rs.6,500/-** (Rupees Six Thousand Five Hundred Only) in the form of demand draft only in favour of **BANK OF BARODA** Payable at **Mumbai.**
- 04b Tender document other than price bid
03. This envelop shall be super scribed "ENVELOP NO.1" ELECTRICAL Work for **E-LOBBY –BRANCH** at **GARDEN BUILDING, VAKOLA PIPE LINE, VAKOLA SANTACRUZ (E) MUMBAI.**
04. ENVELOP NO.2” shall contain only bill of quantities duly filled in and signed on each page by the tenderers. No commercial or technical condition or qualification of any sort shall be indicated by the tenderer in this envelop otherwise the tender shall be liable for rejection.
05. This envelop shall be superscribed "ENVELOP NO.2" – **ELECTRICAL** Work at for **E-LOBBY** at **GARDEN BUILDING, VAKOLA PIPE LINE, VAKOLA SANTACRUZ (E) MUMBAI.**
06. Tenders received late on account of any reason whatsoever and telegraphic tenders will not be entertained.
07. **Bank Of Baroda** discourages the stipulation of any condition by the tenderers. The

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conditional tenders will liable to be rejected.

08. Validity of Tender: the tender shall be valid for a period of 90 days, from the last date of submission of the tender.
09. **Bank Of Baroda** is not bound to accept the lowest tender and reserves the right to reject any or all the tenders assigning any reason therefore.
10. All the rates indicated in the tender shall be **INCLUSIVE OF ALL MATERIAL CHARGES, TRANSPORTATION, LOCAL LEVIES AS APPLICABLE, LOADING, UNLOADING, LIFTING- SHIFTING, ERECTION, TESTING , COMMISSIONING, VAT, SALES TAX, ANY ADDITIONAL/SPECIAL DUTIES, EXCISE, CUSTOM DUTY ETC. AS APPLICABLE.**
11. The rates quoted shall also be inclusive of Local Authorities Permission/ Handling of Municipal / a Local problem is in contractor's scope of work, including obtaining verbal local permissions for smooth functioning the project, Bank shall not pay any extra amount for the same.

Yours faithfully,

Deputy General Manager

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FORM OF TENDER

To,
The Deputy General Manager
BANK OF BARODA
 Mumbai Metro Central Region,
 1st Floor, Kedy Shopping Arcade,
 233-234 Belasis Road,
 Nagpada, Mumbai 400 008

Dear Sir,

Having examined the drawings, specifications, designs and bill of quantities, relating to the works specified in the memorandum hereinafter set out and having examined the site of the works specified in the said memorandum and having acquired the requisite information relating thereto as affecting the tender, I/we hereby offer to execute the works specified in the said memorandum at the rates mentioned in the attached bill of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in condition of tender, appendix to the form of tender, articles of agreement, conditions of contract, bill of quantities and with such materials as are provided for, by, and in all other respects in accordance with such conditions so far as they may be applicable.

Memorandum

Description of works	ELECTRICAL Work at E-LOBBY-BRANCH at GARDEN BUILDING, VAKOLA PIPE LINE, VAKOLA SANTACRUZ (E) MUMBAI.
Earnest money deposit	Rs. 6,500/- (Rupees Six Thousand Five Hundred Only)
Security deposit	Total 5% of the contract value consisting of initial security deposit 2% of contract value and retention amount @ 10% to be deducted from the running bills subject to maximum of 5% of the contract value including Initial Security deposit.
Time allowed for completion	06 Weeks from the date of commencement

Should this tender be accepted, I/we hereby agree to abide by and fulfill the terms and provisions of the said conditions of contract annexed hereto so far as they may be applicable or in default thereof to forfeit and pay to **BANK OF BARODA** the amount mentioned in the said conditions.

I/we have deposited a sum of **Rs. 6,500/-** (Rupees Six Thousand Five Hundred Only) as earnest money in the form of Demand draft with the **BANK OF BARODA**. Should I/we fail to execute the contract when called upon to do so, I/we do hereby agree that this sum shall be forfeited by **BANK OF BARODA**.

All information and documents as required to be submitted with the tenders.

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Our bankers are

The names of partners of our firm are

Name of the partner(s) of the firm authorize to sign:

Name of the persons having power of attorney to sign the contract (certified true copy of the power of attorney should be attached.

Yours faithfully

Signature of contractor

Signature and addresses of witnesses

APPENDIX TO FORM OF TENDER

Item	Reference No	description
Contract value	1(XXii) of GCC	Total value of the tender as accepted by the employer
Date of commencement	37 of GCC	01 From date of work order.
Time of completion	39 of GCC	04Weeks from the date of Commencement.
Liquidated damages for delay	43 of GCC	½% of the contract value per week or part thereof.
Defect liability period	32 of GCC	365 days from the date of virtual completion certificate.
Earnest Money deposit		Rs.6,500/- in the form of DD in favour of Bank Of Baroda
Insurance		You are further requested to take out necessary insurance covers, indemnity bonds, labour permissions at your cost.
Minimum value of RA bills	47(iii) of GCC	Rs.2,00,000/-
Payment of RA bill	47(iii) of GCC	Value Assessed by Architect within 7 working days and balance amount within 15 working days after submission of bill with complete information and voucher etc.
Initial Security Deposit		2% of contract value
Submission of final bill	47(iv) of GCC	within 45 days from the date of final completion as certified by the Engineer.
Payment of final bill	47 (iv) of GCC	Within 90 days from the date of submission of the final bill by the contractor
Retention Money	46 of GCC	10% of interim bill subject to maximum of 5% of contract value
Release of security deposit	46 of GCC	50% upon issue of certificate of virtual completion & 50% after issue of no dues certificate
Price variation	29 of GCC	Firm price. No escalation

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ARTICLES OF AGREEMENT

(On STAMP PAPER of Rs.100/-)

ARTICLE OF AGREEMENT made thisday of **TWO THOUSAND EIGHTEEN (2018)** BETWEEN the **BANK OF BAORDA**, a company incorporated and registered under the Companies Act, 1956 and having its registered Head office at **BANK OF BARODA** at **REGIONAL OFFICE The Deputy General Manager BANK OF BARODA** Mumbai Metro Central Region, 1st Floor, Kedy Shopping Arcade, 233-234 Belasis Road, Nagpada, Mumbai 400 008. hereinafter called “Employer” (which expression shall include its successors and assigns wherever the context or meaning shall so require or permit, of the one part and
..... (hereinafter called the “Contractor”) (which expression shall include its successors and assigns wherever the context or meaning shall so require or permit) of the other part.

WHEREAS the Employer is desirous of carryout the **ELECTRICAL Work E-LOBBY-BRANCH** at **GARDEN BUILDING, VAKOLA PIPE LINE, VAKOLA SANTACRUZ (E) MUMBAI**. as mentioned, and has got drawings, specifications and the bill of quantities prepared by their Architects/Consultants which have been signed or on behalf of the parties hereto.

AND WHEREAS the Contractor has agreed to execute upon and subject to the conditions set forth herein and to the conditions set forth in the special conditions and in the Bill of Quantities and conditions of contract (all of which are collectively hereinafter referred to as “The said terms & conditions”, the works, shown upon the said drawings and/or described” in the said specifications and included in the said bill of quantities at the respective rates therein set forth amounting to the sum as therein arrived at or such other sum as shall become payable thereunder (herein after referred to as the said “contract value”).

NOW IT IS HEREBY AGREED AS FOLLOWS:

- 01 In consideration of the said Contract Value to be paid at the times and in the manner set forth in the said terms & conditions; the contractor shall upon and subject to the said terms & conditions execute and complete the works shown on the said drawings, and described in the specifications and/or bill of quantities.
- 02 The Employer shall pay the contractor The Said Contract Value or such other sum as shall become payable at times and in the manner specified in the said terms & conditions.
- 03 The said terms & conditions and Appendices thereto shall be read and construed as forming part of this Agreement and the parties hereto shall respectively abide by submit

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themselves to the said terms & conditions and perform the agreements on their part respectively in the said terms & conditions contained.

- 04 The contract is neither a fixed lump-sum a contract nor a piece work contract but is a contract to carry out the work in respect of the entire work as defined in the contract documents to be paid for according to actual measured quantities at the rates contain in the bill of quantities or as provided in the said contract documents.
- 05 The contract shall afford every reasonable facility for the carrying out of all works relating to DG Sets in the manner laid down in the said conditions, and shall make good any damages done to walls, floors, etc. after the completion of such works.
- 06 The Employer reserves to itself the right of altering the Drawings and nature of the work by adding to or omitting any items of work or having portions of the same carried out without prejudice to this Contract.
- 07 Time shall be considered as the essence of this Contract and the Contractor hereby agrees to commence the work from date of Letter of Acceptance and to complete the entire work within **06 Weeks** subject nevertheless to the provision for extension of time.
- 08 All payments by the Employer under this contract will be made only at Mumbai.
- 09 All disputes arising out of or in any connected with this agreement shall be deemed to have arisen at Mumbai and only court in Mumbai shall have jurisdiction to determine the same.
10. That the several parts of this Contract have been read by the Contractor and fully understood by the Contractor. The Contractor shall not be entitled for the payment for the quantities beyond the tendered quantities unless ordered for by specific written instructions from the engineer.

IN WITNESS WHEREOF THE Employer and the Contractor have set their respective hands to these presents and two duplicates hereof the day and year first hereinabove written. (If the contractor is a partnership or an individual).

IN WITNESS WHEREOF the Employer has set its hand to these presents through its duly authorized official and the Contractor has caused its common seal of to be affixed hereunto and the

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said two duplicates/has caused these presents and the said two duplicates hereof to be executed on its behalf, the day and year first hereinabove written (If the Contractor is a company).

Signature Clause

SIGNED & DELIVERED by the **BANK OF BARODA** by the hand of

Shri _____
(Name and Designation)

_____ in
the presence of

(1) _____

Address _____

(2) _____

Address _____

Witness

SIGNED AND DELIVERED BY _____ in
the presence of

If the party is a partnership firm of an individual should be signed by all or on behalf of all partners.

(1) _____

Address _____

(2) _____

Address _____

Witness

THE COMMON SEAL OF _____

Was hereunto affixed pursuant to the resolutions passed by its Board of Directors at the meeting held on _____ in the presence of

(1) _____

(2) _____

Directors who have signed these presence in token thereof in the presence of

If the contractor signs under its common seal the signature clause should tally with

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(1) _____

the sealing clause in the Articles of Association.

(2) _____

SIGNED AND DELIVERED by the
contractor by the hand of Shri

And duly constituted attorney

If the Contractor is signing by the hand of power of attorney whether a company or individual.

SECTION-V

GENERAL CONDITION OF CONTRACT ELECTRICAL INSTALLATION

01 **GENERAL**

These conditions of contract are to amplify the specification, schedule of quantities and drawings in addition to those conditions specified from time as additions or omission to those said conditions of contract.

01a "Employer" / "Owner" means – **BANK OF BARODA** at at **REGIONAL OFFICE The Deputy General Manager BANK OF BARODA** Mumbai Metro Central Region, 1st Floor, Kedy Shopping Arcade, 233-234 Belasis Road, Nagpada, Mumbai 400 008. and includes the Employer's representatives, successors and assigns.

01b "Architect" means **DILIP KULKARNI & ASSOCIATES - 5, Laxmi Building, Municipal Chawl, Ground Floor, Dr. Ambedkar Road, Near Jaihind Talkies, Chinchpokli (E) Mumbai - 400 033.**

and their authorized nominees and representatives or such other firms / persons, as shall be nominated by the Employer.

02 **ORDER OF PRECEDENCE**

If any discrepancy is noticed in these conditions of contract, specification, schedule of quantities and drawings, then the Bidder at the time of filling the tender shall report and seek clarifications for the same. Suitable clarifications then shall be issued to all the concerned Bidders by way of a circular. In case none of the Bidders report such a discrepancy and the same is brought out by the contractor on award then such a discrepancy shall be overruled and the most stringent of the condition as stated above shall apply.

03 Owner, architects and Electrical consultants

Owner: - As mentioned in the special condition of contract

Architects: - As mentioned in the special condition of contract

Electrical: - As mentioned in the special condition of contract

Consultants

04 **SITE**

The site of works is located as mentioned in the memorandum .the site for the purpose of this contract shall be the area demarcated as “site” in contract drawing.

05 **INSPECTION OF SITE**

The contractor shall visit the site before tendering and get acquainted with the conditions at site, the contractor shall be deemed to have included in his tender rates, allowances for all preliminary work connected with the work and all other conditions that affect the work.

06 **SCOPE OF WORK**

The work to be carried out under this contract comprises of the internal and external Electrical Installation for the works as mentioned in the memorandum. The contractor shall carryout and

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completes the said work under this contract in every respect in conformity with the current rules and regulations of the local electrical authority, the Indian standard Institution and with the directions of and to the satisfaction of the consultations. The contractor shall furnish all the labour and install all materials, appliances equipment (except those items which will be supplied by the owner to the contractor at site) necessary for the completion, and testing of the whole electrical installation as specified herein and shown on the drawings as being furnished or installed but which are necessary and customary to make compete installation with outlets for power, light, telephone conduits and other electrical systems shown on the schedule or described herein ,properly connected and in working condition. The work shall include all incidental jobs connected with electrical installation such as excavation of trenches and back filling, cutting /drilling and grouting for fixing of fixtures, equipment etc.

07 **FEES, PERMITS AND TESTS**

The contractor shall obtain and pay for any fees and permits required for the installation of the work .the owner shall arrange only for payment of service connection charges and any other security deposit for getting electrical connections and any other security deposit for getting electric supply On completion of the work, the contractor shall obtain and deliver to the consultants certificates of final inspection and approval by the Local Electrical Supply Authority .The consultants shall have full powers to require the materials or work to be tested by an independent agency at the Electrical Contractor's expense in order to prove their soundness and adequacy.

07 a. **ADDITIONAL SECURITY DEPOSIT**

In case L-1 bidder quotes abnormally low rates (i.e. 10% or more, below estimated project cost), the bank may ask such bidder to deposit additional security deposit (ASD) equivalent to difference of estimated cost vis-à-vis L-1 quoted amount for due fulfilment of contract. Such ASD could be in the form of FDR / Bank's guarantee in the Bank's name as per format approved by the Bank. On successful completion of work ASD will returned to the contractor. In case contractor fails to complete the work in time or as per tender specification or leave the job incomplete, the bank will be at liberty to recover the dues from ASD or to forfeit such ASD as the case may be within its sole discretion.

07 b. No interest shall be paid to the amount retained by the Bank as Security Deposit.

08 **DRAWINGS & SPECIFICATIONS**

The specifications and schedule of rates shall be considered as part of this contract and any work or material shown on schedule and not called for in the specifications or vice versa, shall be executed as if specifically called or in both. The drawings indicate the extent and general arrangements of the fixtures, controlling switches, wiring system etc. and are essentially diagrammatic. The drawings indicate the points of termination of conduit runs and broadly suggest the routes to be followed. The work shall be installed as indicate on the drawings however, any minor changes found essential to coordinate the installation of this work with the other trades shall be made without any additional cost to the owner, the data given herein and the drawings is as exact as could be secured, but it's complete accuracy is not guaranteed. The drawings are for guidance of the contractor and exact locations; distance levels will be governed by the building. The contractor shall examine all architectural, structural, plumbing and sanitary and electrical drawings before starting the work and report to the consultants any discrepancy which in his option appears on them and get them clarified .he shall not be entitled to any extras for omission or defects in electrical drawings or when they conflict with other work.

09 **CONDUIT LAYOUT**

Prior to the layout of the conduits, the contractor shall submit to the consultant detailed layout plans of the conduit network and get the same approved .the layout plan shall contain

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particulars regarding size and layout of the junction boxes provided along with routes of these conduits.

10 **SHOP DRAWING**

The contractor shall prepare and submit the consultants for his approval detailed shop drawings of distribution Boards, switch Boards, special pull boxes and other equipment to be fabricated by contractor within 30 days of signing of the contract.

11 **SITE ORDER BOOK**

To be recorded noting by the consultants/owner the contractor shall maintain a site order book at the site of works, when necessary the consultants/owner will utilize the book to issue instructions to the contractor shall follow these instructions in the execution of his work.

12 **MANUFACTURER'S INSTRUCTIONS**

Where manufacturers have furnished specific instructions, relating to the materials used in this job, covering points out specifically mentioned in these documents, these instructions should be followed in all cases.

13. **MATERIALS AND EQUIPMENTS**

All materials and equipments shall confirm to the relevant standards and shall be of the approved make and design. Unless otherwise called for only the best quality of materials and equipments shall be used .the contractor shall be responsible for the safe custody of all materials and shall insure against theft, damage by fire, earthquake etc.

A list of items of materials and equipments, together with a sample of each shall be submitted to the consultants within 30 days of the award of the contract. Any items which is proposed as a substitute shall be accompanied by all Technical Data giving sizes, particulars of materials and the manufacturer's name, at the time of the submission of

Proposed substitute the contractor shall state the credit, if any due to the owner in the event the substitution is approved .all changes and substitution shall be requested in writing and approvals obtained in writing from the consultants. Where no specific make of materials is specified, any first class product of a reputed manufacturer may be used, provided it conforms to the requirements of these specifications. The same will be accepted after the approval of consultant/owner.

14 **GUARANTEE**

At the close the work and before issue of final certificate of virtual completion by the consultants, the contractor shall furnish a written guarantee indemnifying the owner against defective materials and workmanship for a period of one year after completion. The contractor shall hold himself fully responsible for reinstallation or replace free of cost to the owner.

14a Any defective material or equipment supplied by the contractor.

14b Ay material or equipment supplied by the owner, which is proved damaged or destroyed as a result of defective workmanship by the contractor.

15 **AFETY OF MATERIAL**

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The contractor shall provide proper and adequate storage facility to protect all the materials and equipment including those issued by the owner 'against damage from any cause whatsoever.

16 **COMPLETION CERTIFICATE**

On completion of the electrical installation a certificate shall be furnished by the contractor, counter signed by the licensed supervise, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local supply authority. The contractor shall be responsible for getting the Electrical Installation inspected and approved by the local Authorities concerned.

17 **SITE ENGINEER**

The contractor shall employ a competent fully licensed, qualified full time Electrical Engineer to direct the work of electrical installation in accordance with the drawing and specifications. The foremen shall be available at all times on the site to receive instructions from the consultants in the day to day activities, throughout the duration of contract, the engineer shall correlate the progress of the work in conjunction with all relevant requirements of the supply authorities.

18 **SCHEDULE AND MANNER OF OPERATION**

Time being the essence of this contract, the contractor will be expected to furnish all labour and materials in sufficient quantities and at appropriate time, expedite and schedule the work as required and so manage the operation that the work will be completed with that time. In addition to providing a detailed time and progress schedule, the contractor shall submit an outlined and graphical schedule of proposed procedure to the consultants and the owner. Time of completion of work is as mentioned in the fiscal aspects.

19 **WORK AREA**

On no account shall the contractor allow workman, plants or materials to stray on to areas outside permitted work areas.

20 **ELECTRICAL PROJECT DATA**

20a **Power distribution**

The power distribution to the various units of the site shall be at 415 Volts, 50 Hz, 3 Phase, and 4 Wire system, with solidly earthed neutral system.

20b **Lighting Distribution**

The lighting distribution and small heating loads in the site and ancillary units shall be at 230 Volts, 50 Hz, 1 Phase, 2 Wire, 50hz, supply system

20c **Permissible variations**

The permissible variation in supply frequency and voltages shall be as per the standards and limits laid down in the relevant sections of Indian standards specifications, and shall be limited to combined variations of +/- 15%

20d **Equipments**

All electrical equipment covered under this tender shall have been deemed to withstand the above voltages with their permissible variations in voltage and frequencies and so as to ensure the conditions performance of the equipment.

21 **CLIMATE**

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The site is as mentioned in the memorandum. Recorded variations in temperature and climate are as mentioned in the memorandum.

22 **APPROVED MATERIALS MAKE AND DRAWINGS**

- 22a The list of approved materials and makes are listed separately under Annexure of this tender. These shall be deemed to form a part of specifications of the tender. Wherever a choice of makes is indicated it will be deemed that the owner/consultants shall have the right to select the equipment in the series is deemed to form a part of specifications of the tender. Wherever a choice of makes is indicated it will be deemed that the owner/consultants shall have the right to select the equipment in the series of different choice of makes offered. However, in case of non-availability or larger delivery period or otherwise, the tendered may make a specific request to the owner /consultant towards the alternate choice. It will be then at the entire discretion of the aforesaid personnel to call upon the contractor to supply the same of alternatively.
- 22b Only certain drawings are made available to the tenderer along with this tender. The rest of the drawings are marked as reference drawings. These drawings shall be made available to the tenderer at the office of the consultant's office in Bombay.
- 22c The tenderer/bidder shall indicate clearly all other drawings; if he deems it necessary for the compliance of his offer .the tenderer/bidder then shall clearly set out the facts for including of the same in his offer. However, all such variations shall be only considered by the owner /consultants. if deemed to be absolutely necessary and if complied to the specifications at out herein or in accordance to the relevant codes of practice of Indian standard specifications and insurance tariff advisory committee regulations. Accordance to the relevant
- 22d The tenderer/bidder shall bring out clearly the equipment offered by him in his offer. This shall form the integral part of scrutiny of his offer. In general, all equipments offered shall comply to either reputed makes and /or ISI certified and tested. These shall be subject to the final approval of the owner/consultants. All relevant technical data and specifications of the Electrical equipment shall be brought out clearly in the Technical data sheets to be submitted along with the schedule of quantities.

23 **GENERAL CONDITIONS OF SUPPLY OF ELECTRICAL EQUIPMENTS**

- 23a The tenderer/bidder shall submit all technical data's and catalogues of all relevant manufacturers he wishes to supply in his offer. However, the supply and selection of materials and make shall comply to the standards and approvals set herein only .if any deviations are noted, they shall be listed separately, the bidder at his own discretion may list out any such reasons on quality/specifications /technical data's for deviating from the approved makes. These shall then be deviations shall only be made by bidder as alternate to the make and materials specified. If these are not indicated then the bidder's offer is likely to be rejected in to. However, in the case of non-availability of larger delivery period or otherwise, the tenderer may make a specific request to the owner /consultants towards the alternate choice .it will be then at the entire descriptions of the aforesaid personnel to call upon the contractor to supply the same of alternatively.
- 23b Only certain drawings are made available to the tenderer along with this tender. The rest of the drawings are marked as reference drawings. These drawings shall be made available to the tenderer at the office of the Consultants office in Mumbai.

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- 23c The tenderer/bidder shall indicate clearly all other drawings, if he deems it necessary for the compliance of his offer. The tenderer/bidder then shall clearly set out the facts for including of the same in his offer. However, all such variations shall be only considered by the Owner/Consultants if deemed to be absolutely necessary and if complied to the specifications at out her in accordance to the relevant codes of Practice of Indian Standard Specifications and Insurance Tariff Advisory Committee regulations.
- 23d The tenderer/bidder shall bring out clearly the equipment offered by him in his offer. This shall form the integral part of scrutiny of his offer. These shall be subject to the final approval of the Owner/Consultants. All relevant technical data's and specification of the Electrical equipment shall be brought out clearly in the Technical Data Sheets to be submitted along with the Schedule of Quantities.
- 23e The successful tenderer/bidder shall submit minimum eight sets of all equipments drawings, maintenance manuals, test certificates, guarantees of equipments etc. to the Owner, at the time of Supply.
- 24 **GENERAL CONDITIONS FOR TESTS TO BE CALLED FOR APPROVAL PURPOSE**
- 24a The successful tenderer/bidder shall carryout in the presence of Owner's Representative all such tests that are underlined in the Annexure. Such tests shall be carried out at the manufacturers or at works of the bidder or at sub works of the Bidder in a manner as underlined the said Annexure.
- 24b The successful tenderer shall then forward all the relevant copies of Tests so performed in 8 set for the record of the Owner/Architect.
- 24c The successful tenderer shall consider all these costs in the net unit rate under specific items in the tender in stated items in Schedule of Quantities.
- 24d The successful tenderer shall give clear 15 days notice in writing for all such tests to be carried out at relevant place of manufacture, works, sub-works etc. The cost incidental to such tests being carried out shall be borne by the successful tenderer and shall be deemed to have been included in the specific unit rate of that item. However, the cost incidental to the owners Representative making such visits for inspection only shall be borne by the owner in a manner-determined fit by the Owner.
- 24e The successful tenderer shall, however at this discretion quote separately, if so desired to such costs of such tests carried out.
- 25 **VARIATION IN TENDER QUANTITIES**
Quantities in the Schedule of work are tentative and approximate and are subject to variation to any extent. Each items rate shall be determined at the prevailing prices of such items in the Electrical market. The profits/charge shall be determined on the basis of the present tender under quotation. However, the bidder found necessary may be called upon by the Architect/Owner, to show the rate analysis for such an items in the then quote offer.
- 25a Nothing shall, however, absolve the successful tenderer from not performing such deviated items.

25b The Owner's Representative shall, however, prepare a Site Variation order and indicate the same to the successful tenderer. Such increase in quantities shall then be deemed to form the part of the Contract earlier executed. In the event of the successful tenderer not performing such an obligation it will be left to the entire discretion of the Owner alone to carry out the stated works at the rates arrived at the costs and risks of the successful tenderer.

25c All variations in quantities, if he shall indicate found necessary by the successful tenderer and the same to the Owner. On receipt of such a variation, the Owners Representative shall prepare the variation order, if found necessary then, within 30 days from the receipt of such a variation.

26 **MODE OF PAYMENTS**

The mode of payments for this contract shall be on item rate basis and shall include all quantities specified in the bill of quantities of this tender. It shall be further deemed that all variations and deviations. If specifically agreed to in writing shall also form an extended part of this tender and shall be subject to measurements. All payments released to the successful contractor shall be subject to the first verifications of quantities on the basis of mode of measurements herein stated for the sake of clarifications the different terms stated herein after shall form the basis of mode of measurements taken with a specific purpose of determining the extent of work executed. This shall primarily form the basis of the billing of quantities for payments.

27a **JOB**

It shall be defined as all works specified in the detail specifications and in the bill of quantities. These shall mean all works associated with it for the specific purpose of commissioning those items. Nothing shall be deemed excluded even though specifically not brought out in the tender. It shall be basically the responsibility of the successful bidder/tenderer to understand the meaning herein contained.

27b **LUMP SUM**

It shall mean all works included in this item and shall not be subject to any individual items as a piece of running meter item. Everything under this unit shall be considered to mean that every item required for completing and commissioning that specific item.

27c **METER**

It shall mean the standard measurement unit as defined in the International Measurement Codes. These shall be the basis of unit, wherever, specified and shall not contain any tail wires, overlapped joints, wastage of cut lengths etc.

27d **NUMBER (NO.)**

These shall be deemed to contain all physically measurable number of quantities executed in the course of the contract.

27e **POINTS**

Under the heading of light point wiring, power point wiring, socket/ receptacle outlets, this unit shall be applicable. The unit defined for various points applicable and defined as stated herein under: -

27f light points controlled by one switch or outlet shall be termed 'Primary point'.

Note1: - For wiring to light points shall also include wiring from distribution board to individual switchboard to light point, circuit wiring including single pole 5A

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switches, switch box, hardware, conduit fixing accessories, screws, and terminations in ceiling rose/slant holders/ angle lamp holder as called for in the schedule of quantities.

Note2: - For Group wiring controlled by 1 No. Single pole switch of 5/15 Amps rated & completed as in Note 1.

Note3: - For set of points controlled by 1 No. MCB, the cost of MCB shall be considered in the MCB DB item but however wiring from Distribution Board to switch board and Individual points including all the materials as in Note1/2.

27g Fan points considered shall mean each point complete with boards, control switch, termination in ceiling rose/Junction box, flexible wiring to fan from ceiling rose, including provision of fan hook in the ceiling as 'one point' including circuit wiring.

27h 5 Amps. 3 pin socket outlets shall be considered as 'one point' and shall be deemed to contain all accessories required including circuit wiring.

27i 5 Amps. 3 pin socket outlet point as 'one point' with control switch, socket top, earth pin connections and all associated wiring from the Board including circuit wiring.

Note: -

The contractor shall give due notice to the owner/Employer and/or architects in writing whenever any work is to be buried in the earth or made in accessible later on, in order that the work may be inspected and correct dimensions taken before such burial in default where of the same shall be the option of the owner /Employer and/or architects be either opened up for measurement at the contractors expense and no allowance shall be made for such work.

28 **MODE OF CERTIFICATION AND PAYMENT**

All works executed by the successful tenderer shall be subject to joint measurement, one representative of the owner/Employer. These shall be recorded in a measurement book. The successful tenderer or his assigned representative then shall be called upon to sign the measurement book, as an indication of acceptance of the measurements. Thereafter, nothing shall herein mean to cancel/alter/differ/change the recorded measurements. on the basis of these bill of work shall be prepared.

The bill will then be sent for checking and obtaining the approval of the Architects of the owner/Employer. They shall certify the amounts billed and shall determine the amount of the bill. After deductions as recorded for billing purpose, including all pending works if any defective materials if any, income tax deducted at source etc. they shall arrive at the net amount payable to the successful contractor.

The certificate issued by the Architects thus shall form the recommended basis of payments to the contractor by the owner. The certificates issued will be in quadruplicate and one set shall be forwarded to the contractor for his personal records. The time allowed for certifying the contractor's bills by Architect is determined to be one week from the date of receipt of the running for certifying period.

The interim period of honoring the certificate is minimum 10 working days from the date of the receipt of the certified bill by the owner/Employer. No interest shall be paid/charged by the contractor for this Interim period and all further delays, without assigning any reason whatsoever by the Owner/Employer, the contractor shall be at his own liberty such an interest shall not in any event exceed per annum.

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The payment to be made to the contractor shall be made only by Cross Order Account Payee Cheque. No Demand Drafts or any other form shall be permitted or considered for payments except for tax deducted at Source (income) as per the provision of Income Tax Act 1961, as amended by section 28 of the Finance Bill, 1972. The cheques issued by the owner/employer will be from any of the several bank accounts of the owner/employer. No interest/exchange/transfer cost/demand draft charges etc /collection charges of bank shall be borne by the owner/employer. It will be the responsibility of the contractor to pay all these or such money for collection of cheque amount.

The income tax deducted at sources at the rate determined by the income tax Act for this contract shall be done from various running and final bills of the contractor, after deductions of such amounts from the bill, the owner/employer shall issue appropriate certificates indicating the amount of tax deducted at sources of the contractor. The contractor shall indicate to the owner/employer his permanent income tax account number.

29A **SAFETY CODE**

29Aa **SCAFFOLDS**

Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground or from solid construction except in the case of short duration work, which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made either of good quality wood or steel. The steps shall have a minimum width of 450mm and a maximum rise of 300mm. Suitable hand holds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than 1/4 to 1(1/4 horizontal and 1 vertical).

29Ab Scaffolding or staging more than 4mt. above the ground floor swung or suspended from an overhead support of erected with stationary support shall have a guard rail properly bolted, braced or otherwise secured at least 1mt. above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

29Ac Working platform gangways and stairway shall be so constructed that, they do not sag unduly of unequally and if the height of the platform, gangway or stairway is more than 4mt. Above ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in 29Ab .above

29Ad Every opening in the floor of a building or in a working platform shall be provided with suitable means prevent the fall of persons or materials by providing suitable fencing or railing.

29Ae Whenever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.

29Af Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9mt. In length while the width between side rails in rung ladder shall in no case be less than 290mm for ladder up to an including 3mt. in length. For longer ladder this width shall be increased at least 20mm for each additional meter of length.

29Ag A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to construction

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29B OTHER SAFETY MEASURES

- 29Ba All personnel of the contractor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal workers shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses on metal cutting and grinding shall wear safety glasses.
- 29Bb Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
- 29B1 Excavation and trenching
 - 29B1a All trenches, 1.25 meter or more in depth, shall at all times be supplied with a stone ladder for each 30m in length or fraction thereof. The ladder shall be extended from bottoms of the trench to at least 1m., above the surface of the ground. The sides of the trenches, which are 1.5m., or more in depth shall be stepped back to give suitable slope or securely held by timber bracing , so as to avoided the danger of sides collapsing. The excavated material shall not be placed with 1.5m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstance undermining or undercutting shall be done.
 - 29B1b The contractor shall take all measures on the site of the work to protect the public from accidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay any such persons or which may with the consent of the contractor be paid compromise any claim by any such person.

29C DEMOLITION

- Before any demolition work is commenced and also during the process of the work. All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- 299Ca No electrical cable or apparatus, which is liable to be a source of danger over a cable or apparatus used by the operator, shall remain electrically charged.
 - 29Cb All practical steps shall be taken to prevent danger to persons employed from the risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so over-loaded with debris or materials as to render if unsafe.

29D PERSONAL SAFETY EQUIPMENTS

- 29Da All necessary personal safety equipment as considered adequate by the Engineer should be kept available for the use of the persons employed on the site and maintained in condition suitable for immediate use and the contractor should take adequate steps to ensure proper use of equipment by those concerned.
- 29Daa Workers employed on mixing asphalted materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

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29Dab Those engaged in white washing and mixing or stacking of cement bags or any material, which is injurious to the eyes, shall be provided with protective goggles.

29Dac Those engaged in welding works shall be provided with welder's protective eyesight lids.

29Dad Stone breakers shall be provided with protective goggles and protective clothing and sated at sufficiently safe intervals.

When workers are employed in sewers and manholes, which are in use, the contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.

The Contractor shall not employ any men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precautions are to taken:

No paint containing lead products shall be used except in the form of paste or ready made paint.

Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or surface having lead paint dry rubbed and scrapped.

Overalls shall be supplied by the contractor to the workmen and adequate facilities shall be provided to enable the working painters in wash during the cessation of work.

When the work is done near any public place where there is risk of drawing all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

29E **GENERAL**

29Ea All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

29Eb These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named there in by the contractor.

29Ec To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by Labour Officer, Engineers of the Department or their representative.

29Ed Notwithstanding the above clauses there is nothing in these to exempt the contractor from the operations of any Act or Rule or Applicable IS codes is in force in the Republic of India.

30 Contractor needs to submit the list of tools & tackles required for the jobs with its Make, Serial No., Year of purchase etc. The same shall be ascertained by Consultants & PMC. If the list found is insufficient Contractor needs to give an undertaking to procure the tools & tackles as required for the work.

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- 31 The application for additional electricity load requirements will be signed by the owner. All co-ordination work and responsibility for getting electricity load sanction within reasonable time limit, rest on the successful contractor.

I / We hereby declare that I / We have read and understood the above instructions, which have been issued as conditions of the contract.

WITNESS

(Signature of the Tenderer)

TECHNICAL SPECIFICATION

The Electrical installation work shall confirm to the following I.S. Standards (latest additions), Local Supply Authorities Rules and Regulations, Indian Electricity Act & rules, National Building code and Fire Safety Norms. All equipment including cables, wires & components thereof should be manufactured & installed as per standards specified by Bureau of Indian Standards (BIS) Where such standards do not exist, then the covered items should be approved from Architects / Consultants /Clients prior to purchase & delivery to site

- 01) IS: 732 Code of Practice for Electrical wiring installation
(System Voltage not exceeding 650V)
- 02) IS:1646 Code of Practice for fire safety of buildings
(General Electrical Installation)
- 03) IS:9537 PART-II 1981 Rigid steel conduits for electrical wiring.
- 04) IS:2667 Fittings for rigid steel conduits for electrical fittings.
- 05) IS:2509 Rigid non-metallic conduits for electrical installations.
- 06) IS:1293 Pin Plugs and Sockets.
- 07) IS: 694 PVC insulated cables with copper conductors for voltages up to 1100 Volts
- 08) IS:9532 Specification for conduits for Electrical Installation
- 09) IS:3854 5A & 15A Switches.
- 10) IS:3043 Earthing.
- 11) Indian Electricity Act, 1956 and Rules and Fire Insurance Regulations.
- 12) IS : 2026 Specification for power transformer----- Not applicable.
- 13) IS : 2099 Specification for high voltage porcelain bushings. ----- Not applicable

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- 14) IS : 355 Specification for insulating oil. ----- Not applicable
- 15) IS : 3639 Specification for fittings and accessories for power transformer. ----- Not applicable
- 16) IS:2274 Electrical wiring installations (System voltage exceeding 650 volt)
- 17) IS :7752 Guide for improvement of power factor consumer's installations
- 18) IS :5216 Guide for safety procedures & practices in electrical work
- 19) IS:3072 Installation & maintenance of Switch gear
- 20) IS:2551 Guide for danger notice plates
- 21) IS :8923 warning symbols for dangerous voltages
- 22) IS :13947 Specification for low-voltage switchgear & Control gear
- 23) IS :1777 Industrial luminaries with metal reflectors
- 24) IS :1913 General & safety requirement of luminaries
- 25) IS :116 Circuit Breakers for AC system
- 26) IS :3427 Metal enclosed switchgear & Control gear
- 27) IS: 3837 Accessories for rigid steel conduits.
- 28) IS:4047 Heavy duty Air break switches & composite switch fuse units for voltage exceeding 100 volts.
- 29) IS :4237 General requirements for switchgears not exceeding 1000 Volts
- 30) IS :4615 Switch socket outlets
- 31) IS:159: Busbars & busbars connections
- 32) IS :415 Marking & arrangement for switchgear boards main connections & auxiliary wiring.
- 35) IS :415 Tungsten filament lamp
- 36) IS : 722 Three phase watt hour meter with MDI
- 37) IS:1248 Directing acting electrical indicating instruments
- 38) IS :1293 Three pin plugs & sockets outlets.
- 39) IS :1947 Floods lights
- 40) IS:2147 Degree of protection provided for enclosure for switchgear
- 41) IS:2418 Tubular fluorescent lamps for general lighting services

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- 42) IS:2509 PVC electrical Conduits
- 43) IS 2075 Current Transformer
- 44) IS 2834 LT Capacitors
- 45) IS 3106 Code of practice for installation & maintenance of switchgear.
- 46) IS :2607 Air break isolators for voltage not exceeding 1000 Volts
- 47) IS:1753 aluminum Conductors for insulated conductor
- 48) IS :3961 Recommended current ratings for cables
- 49) IS:3480 Flexible steel conduits for electrical wiring
- 50) IS:1646 Code of fire safety of building (General Electrical installation)
- 51) IS:1913 General & safety requirements for electric lighting fitting.
- 52) IS:1239 Mild steel tubular & other wrought steel pipe fitting
- 53) IS : 6381 Specifications for construction & testing of electrical apparatus.
- 54) IS: 1818 Isolator & Earthing switches
- 55) IS:3106 Code of practice for selection
- 56) IS:HRC Cartridge fuse unit up to 650 Volts
- 57) IS:10332 Part I to Part V Specification of Luminaries

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A-01 **POINT WIRING:**

a) **METAL CONDUITS:**

All conduit pipes shall confirm to IS 9537 PART-II 1981. Metal conduits shall be ERW black enameled of **wall thickness of 1.6 mm**, 20mm/25mm as the case may be depending upon the number of wires permitted as table-1. The conduits shall be fixed to walls/ceiling with M.S. saddles and spacers at an interval of 1 meter and on either side of bends.

All conduit accessories shall be 16 gauge & bends shall be of inspection type. All bends, couplers, threaded portions etc. shall be painted with anti-corrosive paint. Bends in the pipes shall be done with bending hickies.

All pipes shall be cleaned for sharp burrs. Switch boxes shall be of G.I. 16G/14G. The switch boxes shall be concealed as per site requirement & as per Architect's/Consultant's Instructions.

Point shall be controlled with 6A switch or directly from DB as specified in schedule of quantities. Where plate type switches are not specified the switch-board shall have 3mm thick hylum sheet on which switches shall be mounted.

The wiring shall be carried out with multi stranded PVC insulated copper wires of 1.5 Sq. mm. 2 Nos. (Phase & Neutral) & 2.5 Sq.mm (Earth). In all cases, the earth shall be of green color and neutral shall be black color. All wires used shall be of **1100V** grade. The point wiring shall be inclusive of circuit wiring from Distribution Board to the switchboard unless otherwise stated in schedule of quantities. The circuit wiring shall be with 3 Nos. of 2.5 Sq.mm PVC insulated multi stranded copper conductors color coded as detailed above. The rate shall also be inclusive of any chasing as directed by the Architects /Consultant / Client's Engineer to conceal the drops and finishing the same.

In case of group control directly from Distribution Board, the primary point shall be from D.B. to the first point and secondary point from first point to the next point looped. The point shall terminate into **three way junction box. (In case of wiring in PVC conduit the 3 plate-ceiling rose to be utilized)**

While laying the conduits in the slab before casting the slab, all drops shall be laid accurately to fall in position of the switchboard. Junction boxes shall be sand filled. All joints shall be airtight. Conduits shall be fastened to the re-enforcement properly so that the conduits do not get dislocated while casting the slab. All conduits shall have 18 swg fish wire.

b) **PVC CONDUITS:**

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The PVC Conduits shall conform to latest **IS:2509** and shall be of wall thickness of 2mm. The conduits shall be joined with PVC adhesive at Joints. The Conduits shall be fixed to walls/ceilings with GI, Spacers and Saddles at an interval of 60cms & on either side of bends. The number of wires drawn in the conduits shall be as per table 1. The point wiring shall be controlled as in (a) above. The wiring shall be done with 2 Nos. of 1.5 Sq. mm (Phase & Neutral). & 2.5 Sq.mm (earth) PVC Insulated, copper conductors, multi stranded and color coded with green as earth and black neutral.

The circuit wiring shall be with 3 Nos. of 2.5 Sq. mm PVC insulated, copper conductors, multi stranded from distribution board to switch board and the rate shall be included in the point wiring unless otherwise stated in the schedule of quantities. All other details shall be as for metal conduits.

TABLE :1

Size of Wires (Made to Is 694)	Capacity of conduit	
	20mm dia	25mm dia
1.5 sqmm	7	15
2.5 sqmm	5	11
4.0 sqmm	4	8
6.0 sqmm	3	6
10.0 sqmm	2	4

A.02. DISTRIBUTION BOARDS:

This specification covers the design, manufacture, assembly, testing at works, supply, installation and commissioning of distribution boards at site.

The system and accessories shall be complete in all respects and any device not included specifically in this specification, but essential for proper operation of the equipment and also to meet statutory requirements shall be deemed to be within the scope of the specification whether it is mentioned in the Technical Specification or not.

If the vendor finds that it is required to undertake any work which is not sufficiently defined in this specification, or discovers that this specification conflicts with any other codes, standards and regulations which shall be required to comply, the same shall be clarified in writing from the Owner/Consultant before undertaking work involved for avoiding the delay.

A.2.1 CONSTRUCTION

The distribution boards shall be fabricated out of 16 SWG sheet steel metal, totally enclosed dust damp and vermin proof **IP52**, dead front, hinged door type of bolted/welded construction suitable for wall or floor mounting.

The board frames shall be fabricated using suitable mild steel structural sections or pressed & shaped cold rolled sheet steel of thickness not less than 2.0mm. The frames shall be enclosed by cold rolled sheet steel of thickness not less than 1.65mm, smoothly finished, leveled & free from flaws. Doors & covers shall be made of cold rolled sheet steel of thickness not less than 1.65mm. Stiffeners shall be provided wherever necessary.

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A.2.2 **BUSBARS**

The busbar shall be air insulated and made up of high conductivity high strength aluminum or copper bus bars liberally sized with high safety factor for the required rating. The current density shall not exceed 0.8 Amps per sqmm & 1.25 Amps per sqmm for copper & aluminum respectively. The neutral bus shall be rated for capacity of phase bus unless otherwise stated in schedule of quantities/drawings. However, the minimum size of bars shall be 25mm X 3mm. The neutral busbars shall have adequate number of terminals for all number of outgoing single phase circuits and the holes shall be suitable for multi-strand wires. In the same way suitable earth bus shall be provided inside each distribution board for earthing of the lighting/power circuits and also earthing of distribution board. In case of 3 Phase DB used for single phase outgoing, three independent neutral bars shall be provided.

A.2.3 **MINIATURE CIRCUIT BREAKERS**

Miniature circuit breakers (MCB) shall be of heat resistant, moulded type designed, manufactured and tested as per IS-8828.

The MCBs shall have inverse tripping characteristic against overloads and instantaneous trip against short circuits. The MCB shall be of fault current limiting device also.

The MCB shall be clip on type to the DIN rail. The ON & OFF positions of the switch handle shall be clearly marked. The MCB shall be suitable for operating in an ambient temperature of 45 deg C. without derating. The MCB shall be suitable for 415V, 3 phases, 50 Hz systems with a fault level of 9-10 KA (RMS) symmetrical. The terminals of MCBs shall be suitable for use with eye lugs. The 4 pole, 3 pole and 2 poles MCBs knobs shall be trunked with adequate strength tandem pin.

Each distribution board shall have individual hinged/bolted gasketed doors with suitable screws. Removable conduit entry plates shall be provided at top and bottom of the DB to facilitate drilling the conduit holes at site to suit individual requirements or knock out shall be provided.

Protective insulated cover plate shall be provided inside the panel to shroud all the live parts. Only the operating handle of the switch and the operating knob of the miniature circuit breakers shall be projecting outside the cover plate in case of ordinary DB and shall be inside the front door in case of dust tight DB. The unused outgoing gap of DB shall be suitably blanked with PVC plates at no extra cost. The incoming switch terminal should be suitably shrouded to avoid accidental contact. Each outgoing in the MCB DB shall have shrouding between Phases. The distribution board shall be factory wired and assembled and local fabricated DB shall not be accepted.

If the Distribution Board shall be triple pole and neutral, four pole isolator shall be provided as incomer and for single phase and neutral Distribution Board; double pole isolator shall be provided. Earth leakage circuit breaker to be provided wherever called for.

Suitable label shall be provided to mark the circuit number of outgoing circuits.

A.2.4 **EARTHING**

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The DB's shall be provided with two numbers brass earthing terminals with suitable nuts, washers, etc., for connecting to earth bus outside the DB. In case of flush mounting DB, these shall be provided inside the DB.

A.2.5 PAINTING

The DB sheet steel surface shall be pre treated through seven tank process chemically cleaned to remove scale etc., rinsed dried and shall be finished with powder coated paint over two coats of red oxide primer.

A.2.6 TESTS

Following factory routine tests shall be performed on the equipment before dispatch. The test results shall be sent along with the supply of DB.

01. Mechanical Operation
02. HV test for one minute
03. Insulation resistance at 500 volt DC before/after one minute HV test.

A.2.7 INSTALLATION

The board shall be fixed at accessible heights. The boards shall be solidly fixed to walls/partitions, concealed or open as directed. All connections inside the distribution board shall be neatly arranged and tied with PVC strings. The distribution boards shall be suitably earthed. Legend shall be written on D.B. with paint for identification of D.B. & Circuits.

A-03 CABLES:

Cables shall conform to latest **IS 1554-1988**. Cables shall be heavy duty, armoured, PVC insulated & PVC sheathed 1.1 KV grade aluminum or copper. Cable shall be fixed with G.I spacers & saddles at an interval of 45cms and on every side of bends. The bending radii of cables shall be as per manufacturer's instructions and in no case it shall be less than 12 times the overall diameter of the cable. Cable shall be so installed that they are not subject to mechanical damage. If there is a bend in the cable enclosed in a conduit, care has to be taken to prevent undue compression of insulation. This applies also to the top of vertical runs of longer than 5 meters where there could be compression caused by the weight of unsupported vertical cables. Cables may rest without fixing in horizontal runs or ducts or trunkings. The cables run in cable trays shall be fixed with cable ties at intervals of not more than 30cms. No joints in the cables shall be permitted unless the cables exceed the standard drum length. Joints if so necessary shall be located in accessible position. Termination of the cables shall be done with heavy duty copper/Aluminum lugs and brass cable glands.

Cables laid underground shall be to a minimum depth of 750mm. It shall be ensured that cables laid underground are free of water lines, sewage lines etc. The trenches shall be at least 30cm wide & filled with 10cms thick of layer of dry sand on which the cable shall be laid. Further, 10cms thick **river sand** layer shall be put on the cable over which a brick layer shall be kept. The trench shall then be back filled with soft earth, rammed and consolidated to original level. Cable route indicators made up of **CI shall** be laid at intervals of 20 meters and at all change in directions.

For cables laid on walls aluminum tags shall be fixed showing the size of the cable and the feeder number of the cable. These tags shall be at each end and at least one or two places at intermediate positions.

The mode of measurement of the cables shall be as follows:

01. For top entry of the cable, the measurement shall be taken up to the bottom of that switch-gear.
02. For bottom entry of the cable, the measurement shall be taken up to the top of that switch board.
03. No wastage shall be allowed for measurements.

A-04 SWITCH FUSE UNITS:

Switch Fuse Units shall be of sheet metal or iron clad with HRC fuses as described in schedule of quantities. **SFUs complies to IS:4047**. The unit shall be of robust construction of standard specified make, design to withstand adverse working conditions. It shall have quick break type mechanism with ON and OFF position indicators of the operating handle. The switch shall be interlocked so that the unit cannot be opened in ON condition. The interior shall be so arranged that clearance from live parts are adequate and shrouded. Manufacturer's instructions shall be followed for installation of switch fuse units. The switch shall be solidly earthed. The switch shall be mounted on walls on angle iron support grouted to wall. The supports shall be treated for rust treatment & painted with 2 coats of synthetic enamel paint. The height of the switch-board shall be such that it is accessible for operation & maintenance.

A-05 POWER PANELS:

The Power panels shall be fabricated from MS sheet steel 16 gauge and shall be of compartmental design. The main supporting framework shall be of angle iron or of heavier gauge sheet metal. The panel shall be self-supporting design, dust and vermin proof, dead front and fully inter locked with isolating switches. The panel-mounted switches shall have Interlock defeat for testing and inspection.

The board frames shall be fabricated using suitable mild steel structural sections or pressed & shaped cold rolled sheet steel of thickness not less than 2.0mm. The frames shall be enclosed by cold rolled sheet steel of thickness not less than 1.65 mm, smoothly finished, leveled & free from flaws. Doors & covers shall be made of cold rolled sheet steel of thickness not less than 1.65 mm. Stiffeners shall be provided wherever necessary.

The panel shall be powder coated comprising of seven tank pre treatment, degreasing and descaling in sulphuric acid etc & shall be finished with powder coated paint over two coats of red oxide primer powder coating synthetic enamel paint for smooth finish. The color of paint shall be battle-ship grey or as directed.

The panel shall be designed so as to facilitate inspection, cleaning and repairs. The clearance between phase to phase and phase to earth or metal parts shall be as per relevant IS standards. The metering instruments like volt meter, ammeter etc. shall be flush mounted and shall be of 1.0 class accuracy and of standard design size shall be 96 mm x 96. All indication lamps shall be of LED type.

The busbars shall be air insulated and made up of high conductivity, electrolytic aluminum complying with the requirement of IS 5082:1981 and shall have a fault withstand capacity of 50 KA/1 Sec. The current density shall not exceed 0.8 amp per sqmm & 1.25 amp per sqmm for copper & aluminum respectively All busbars shall be fully screened by means of PVC sleeves in their own compartment running throughout the length of the Panel. Suitable allowance should be made for bus expansion.

The panel shall have separate cable ally and a bus bar chamber. The bus bars shall be rigid hard drawn tinned electrolytic copper wherever specified & sleeved with heat shrinkable sleeves. The current density shall not exceed 1.25 Amps per Sq.mm and the neutral bus shall

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be rated for capacity of phase bus unless otherwise stated in schedule of quantities/drawings. However, the minimum size of bars shall be 25mm X 3mm. Minimum electrical clearance shall be maintained between phases, neutral and body as per IS 4237:1982. All Incoming / outgoing feeders shall have neutral link of appropriate capacity in the compartment of switching device.

Wiring inside the switchgear shall be carried out with 1100 V grade, single core PVC insulated, stranded copper conductor wires.

Minimum size of conductor for power circuit is 4.0 Sq.mm.

Minimum size of conductor for control circuit is 1.5 Sq.mm.

The size for CT circuit wiring should be of 2.5 Sq.mm.

The Panel shall be tested at site before commissioning. The Panel drawings shall be got first approved from Consultants before taking up for fabrication.

All wiring inside the panel shall be done with switchboard copper conductors/cables solid copper links. The insulators for supporting the Bus-Bars shall be epoxy based cast resin. All hinged doors shall be earthed with flexible braided copper earth. An earth bus of copper shall be fixed along the length of the panel at the lower section. Adequate ventilation for the panel shall be provided. Logic diagram of operation of switches shall be painted on the panel. The name plates for each feeder shall be of engraved design and pasted to the respective switch gear. The letters shall not be less than 10mm size for individual feeders and not less than 18 mm for the main feeders. All switchgear to be mounted in the panel shall be as per schedule of quantities.

A-5.1 **General Constructional Features**

Switchgear shall be

A-5-1a Indoor, floor mounting, modular type (wall mounted wherever specified ,instructed)

A-5-1b Provided with protection of IP52

A-5-1c Vermin proof construction

A-5-1d Provided with metal sill frame of structural steel channel section properly drilled for mounting the switchgear along with necessary mounting hardware.

A-5-1e Provided with gaskets all round the perimeter of removable covers & door

A-5-1f No equipment needing manual operation shall be located less than 250mm above ground level.

A-5.2 **MCCBs**

MCCB shall in general conform to IS: 13947 part-2, All MCCB shall be of P2 duty.

MCCB shall be flush mounted on the AC/DC distribution boards.

MCCBs shall be provided with thermo-magnetic type release for over current and short circuit protection. The setting of the thermal release shall be adjustable between 75% to 100% of the rated current. The magnetic release setting shall be adjustable between 300% to 600% of the thermal release setting at site.

MCCBs shall also have 2 NO. and 2NC auxiliary contact either built-in or using auxiliary switch for purchaser's use

MCCBs shall be manually operated. The operating handle should give a clear trip indication.

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Miniature circuit breaker (MCB) shall conform to IEC: 898-1987 and IS: 8828.

The MCCBs shall comprise single units of triple pole construction & shall be rated for 500 Volts AC.

All live parts shall be totally enclosed in a heat resistant moulded insulating material housing.

Operating mechanism shall be quick make, quick break & trip free type.

A-5.3 INSTRUMENT TRANSFORMERS

All CTs will be dry type. All current and voltage transformers shall be completely encapsulated cast resin insulated type suitable for continuous operation at the temperature prevailing inside the switchgear enclosure, when the switchboard is operating at its rated condition and the outside ambient temperature is 50C.

All instrument transformers shall be able to withstand the thermal and mechanical stresses resulting from the maximum short circuit and momentary current ratings of the associated switchgear.

All instrument transformers shall have clear indelible polarity markings. All secondary terminals shall be wired to a separate terminal on an accessible terminal block where star-point formation and earthing shall be done.

All CTs utilized in metering circuit will be of class 1.0 & burden of 10 VA minimum wherever not specified.

All CTs utilized in protection circuit will be of class 5P10 & burden of 10 VA minimum wherever not specified.

All CTs shall be earthed through a separate earth link.

A-06 EARTH PITS

The Earthing station shall be done as per **latest IS 3043 (1987)** and as per drawing no. E1. The earth pit shall be at least 2.5 Mtrs. deep with GI Plate electrode. The GI plate electrode shall be hot dipped of 600mm X 600mm X 6mm thick. The size for copper electrode shall be 600 X 600 X 3mm thick, an alternate layer of salt and charcoal shall be filled up to 200mm above the top of the electrode. The electrode shall be connected with 25mm X 6mm thick GI Flat which shall be terminated with nuts and bolts into brick masonry chamber on top. The brick masonry chamber shall be of size 300mm X 300mm X 300mm deep which will carry the funneling arrangement for watering. A GI Flat of 25mm X 3mm from brick masonry chamber to the switch gear inside the switch room shall be laid underground and/or fixed to walls and the rate for this shall be paid as a separate item.

A.07 EARTHING SYSTEM

All the main earth conductor above the ground level shall be painted with two coats of enamel paint. The following colour code has to be followed:

- | | | |
|------------------------------------|---|-------------------------------|
| (a) Main body earth bus | - | Green colour |
| (b) Main neutral earth bus | - | Black colour |
| (c) Lightning protection earth bus | - | Red colour or as preferred by |

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Owner/Consultant.

Earthing system of equipment earthing, neutral earthing and lightning protection earthing should not be mixed together above the ground. These systems/connections shall be tested in accordance with IS 3043-1987. Earth resistance of the individual system shall be measured after connecting all the electrodes to the bus and the combined value shall be minimum of **1 ohm (One ohm)**.

A-08 ELECTRICAL FIXTURES

All lighting fittings shall be complete with accessories & fixtures necessary for installation whether so detailed under item description or not.

Fixture housing, frame or canopy shall provide a suitable cover for the fixture outlet box or fixture opening.

Fixtures shall be completely wired & constructed to comply with the regulations & standards for electrical lighting fixtures, unless otherwise specified. Fixtures shall bear manufacturer's name & factory inspection label unless otherwise approved.

Wiring within the fixtures & for connection to the branch circuit wiring shall be not less than 1.5 Sq.mm copper for 250 Volt application. Wire insulation shall suit the temperature conditions inside.

Metal used in lighting fixtures shall be not less than 22 SWG. Or heavier if so required to comply with specification of standards. Non-reflective surfaces & trim shall be finished in a baked enamel paint.

Fixtures with visible frames shall have concealed hinges & catches. Recessed fixtures shall be constructed as to fit into an Armstrong /Gypsum/POP false ceiling.

Detail catalogue or, if so required by the architects, sample fixtures shall be submitted for approval to the Architect /Consultants. Shop drawings for non-standard fixtures shall be submitted for approval to the Architects.

A-8.1 INSTALLATION OF ELECTRIC FITTINGS:

Fixtures shall be installed at mounting heights as detailed on the drawings or as instructed on site by the Architect/Consultants.

Fixtures or fixtures outlets boxes shall be provided with hangers to adequately support the complete weight of the fixture. Design of hangers & methods of fastening shall be submitted to the Architects for approval prior to execution at site.

All fluorescent lighting fixtures shall be fixed with down rods or on round blocks as stated in schedule of quantities. The down rods shall be 20 mm dia and 1.6mm wall thickness of ERW black enameled MS. The down rods shall be fixed with ball and socket joints check nuts etc. Lighting fixtures shall be mounted on round block in case of wall mounting.

Fixtures like down lighter, spot lights etc. shall be fixed to the false ceilings as per manufacturer's recommendations.

A-09 POWER FACTOR CORRECTION PANEL:

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The power factor correction panel shall be fabricated from sheet steel & powder coated. The panel shall be compartmentalized with tinned copper bus bars TPN as described for power panels. The capacitor housing should be well ventilated.

The power capacitors shall be APP type, low loss, 3 phase, delta connected & self discharged type.

The power factor control shall be done by automatic power factor control relay for controlling the power factor within the set limits by auto switching of required capacitor Banks. The required Capacity /P.F Banks shall be as per schedule of quantities. The P.F. shall be automatically corrected to near Unity.

The C.T. ratio given in the Schedule/diagram is indicative. The same shall be matched for correct operation depending upon the operating load. The relay shall be totally microprocessor based for setting the desired target power factor band. The APFC relay shall have indications like power ON, low current etc & shall be of required stages as per schedule of quantities. The P.F Panel shall have Auto Manual switching facility.

The general specification shall be as follows:

- a. System supply voltage 415 volts.
- b. C.T. secondary rating 5 A, 5 VA Burden.
- c. Output switching capacity 5A at 230 V AC & 2A at 440 V AC, Operating temperature, 10 degree Centigrade to 50 degree Centigrade. Accuracy better than 1%.
- d. Low current release 10% of full rated C.T.
- e. Switching time between stages 4 to 6 seconds.
- f. Range of indications of PF 0.5 lag to 0.5 lead digital.
- g. Display LED indications.
- h. Range of target P.F. setting 0.90 to 0.99.
- i. Switch for auto/manual operation.
- j. Indications for selection of stages.
- k. Selection of dead band.

For constructional details refer the specifications mentioned at A.05 the same are applicable for APFC panel.

A-10 TESTING OF ELECTRICAL INSULATION:

The following tests shall be carried out after completion of the electrical insulation work.

- 1) Insulation Resistance Test.
- 2) Polarity Test of Switches.
- 3) Earth Continuity Test.

01 **Insulation Resistance Test:** The insulation resistance shall be measured by applying between earth and whole system of conductors or any section thereof with all fuses in place and all switches closed (except in earthed concentric wiring) all lamps in position & both poles electrically connected together, or direct current pressure of not less than twice the working pressure, provided that it need not exceed 500 volts for medium voltage circuits, be applied. Where the supply is derived from 3 wires DC or Poly phase A.C. System, the neutral pole of which is connected to the earth either direct or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured in mega ohms between all conductors connected to one pole of phase conductor of the supply and all the other conductors and switches in off position its value shall be not less than as specified below:

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The insulation resistance measured in mega ohms shall not be less than 50 mega ohms divided by the number of outlets or when PVC insulated cables are used for wiring, 12.5 mega ohms divided by the outlet subject to a minimum value of 1 mega ohm.

A preliminary and similar test may be made before lamps etc. are installed and in this event the insulation resistance to earth shall not be less than 100 mega ohms divided by the number of outlets or when PVC insulated cables are used 25 mega ohms divided by the number of outlets subject to a minimum of 1 mega ohm.

- 02 **Polarity Test of Switches:** In a 2 wire system a test shall be made to verify that all switches in every circuit are fitted in the same conductor throughout and such conductors shall be labeled or marked for connection to the phase conductor or to the non earthed conductor of supply. In a 3 wire or 4 wire insulation a test shall be made to verify that every non linked single pole switch is fitted in a conductor which is labeled or marked to one of the phase conductor of supply.
- 03 **Earth Continuity Test:** The Earth Continuity Conductor including metal conduits and metallic envelopes of cables in all cases shall be tested for electric continuity and electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit breaker measured from connection with earth electrode to any point in the earth continuity conductor in the completed insulation shall not exceed 1 ohm.

TECHNICAL SPECIFICATION OF TESTING AND COMMISSIONING

The scope of work for testing and commissioning of the total installation shall be for the capital equipments like transformers, switchgears, cables etc., and also for the associated equipments like relays CTs, PTs, etc.

The scope of work for testing and commissioning of electrical equipment for the above shall include but not be limited to the following:

- a) Providing sufficient number of experienced Engineers, Supervisors, Electricians so that the installation can be commissioned in stipulated time.
- b) All the instruments, tools and tackles required for carrying out the testing and commissioning shall be provided by the bidder.
- c) The testing of electrical equipment shall be carried out as per the relevant Indian Standards/Code or Practices/Manufacturer's instructions.
- d) Cleaning of electrical equipment, contacts cleaning and greasing etc. All the equipment and material required for above shall be supplied by the bidder.
- e) Correcting the panel/equipment wiring for proper functioning of the schemes required / called for.
- f) Installation and wiring of additional equipment on panels like auxiliary contactors, timers, etc., which may be additionally required for proper functioning of the schemes.

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- g) Checking of equipment earthing and system earthing as a whole.
- h) Testing of all the cables.
- i) Co-ordination with other contractors for testing and commissioning of interface cables.

TESTS TO BE CONDUCTED:

- 01. All tests shall be performed in the presence of the bidder and customer/consultant. For all types of visual inspections, checking, pre-commissioning, commissioning test and acceptance tests, IS Code to be followed for the tests given therein in addition to the instructions in this technical specification. The intention of giving the few test procedures, described below, is to provide a guideline for the bidder. However, bidder shall not restrict themselves in carrying out only the tests described in this document.
- 02. Bidder shall submit their proposed test procedures for approval and shall not commence testing such approval is given.
- 03. Bidder shall check and test all electrical equipment and systems installed and supplied them, including equipment supplied by the Owner.
- 04. Bidder shall supply all necessary test equipment and personnel both craft and supervisory to carry out the work without danger to personnel or damage to equipment.
- 05. Bidder shall ensure that no tests are applied which may stress equipment above the limits for field testing recommended by the manufacturer. Bidder shall be responsible for any damage to personnel or equipment resulting from improper test procedure.
- 06. All defective materials furnished by the bidder and defects due to poor workmanship revealed through field testing, shall be corrected at bidder expense without affecting the completion of the project.
- 07. Client/Consultant reserves the right to interpret and approve all test results prior to energization of circuits or apparatus.
- 08. Bidder shall visually inspect all equipment for defects immediately upon arrival at site including those supplied by the Owner.
- 09. Relay coordination chart and final setting before/commissioning.

MECHANICAL CHECKOUT

After installation, but before any power supply is connected, the contractor shall make a complete mechanical check of all installed electrical equipment and systems. This shall include but not to be restricted to the following:

- a) Check equipment numbers against drawings/documents.
- b) Check name plates of transformers, switchgears, etc., for conformity with the data given in the drawings and specifications.
- c) Check all equipment bus joints and connections for tightness.
- d) Check all cable and wire connections for tightness.

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- e) Check phase sequence.
- f) Check all bushings/insulators to ensure they are clean and un-chipped. Inspect tank cooling tubes and radiators for leaks.
- g) Check silica gel for dryness where breathers are supplied. If the colour of the silica gel is pink, remove from the breather and dry out following manufacturer's recommended procedure, until a light blue colour is restored and replace it.
- h) Check valve in the connecting pipe between the conservator and transformer tank to ensure that valve is in 'open' position.
- i) Check interlocking on access doors for mechanical and electrical safety. Check that key and electrical interlocking system functional and accomplish their purpose.
- j) Check all plug in contacts for alignment and 'grip'.
- k) Check all contactors for free manual operation.

- l) Remove all locking devices installed for shipment.
- m) Check all the coils for their continuity and proper voltages.
- n) Check the arc chutes, arcing horns, main contacts of breakers are clean and undamaged. Check the carriages ride smoothly and reliably on their guide rails. Check for proper operation of circuit breaker operation mechanism, controls and adjustments.
- o) Check the fuses are correctly rated and installed are clear, undamaged and fit for operation.
- p) Check all relays and instruments are clean, correctly connected and undamaged. Check test plugs are installed in all protective relays. Check relays for free manual operation, if applicable.
- q) Check instrument transformer ratings against drawings. Check for proper installation and connection.
- r) Check interlock and auxiliary devices and the operation of the circuit breaker with the protection relay circuit.
- s) Clean the equipment by vacuum cleaner before energizing.

EARTHING:

- a) Bidder shall test the buried earth grid and shall record the values.
- b) Bidder shall inspect and test all earthing work carried out by him, including all interconnections between ground loops, grounding of equipment and ensure all connections are permanent and that the earthing circuit is continuous.
- c) Bidder shall megger and record earth resistance at various earth connection points.

SWITCHGEAR:

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- a) Switchgears rated 433 volts or more shall be tested with a 1000 volts megger.
- b) Auxiliary wiring rated less than 415 volts shall be tested with a 500 volts megger.
- c) All protective relays shall be tested at sufficient points to establish their proper functioning in accordance with the manufacturer's specification and curves.
- d) Operation checks and functional checks on all switchgear panels.
- e) For current transformers insulation test, polarity test, ratio test, secondary injection test, operating current check, service setting in consultation with Client/Consultant.
- f) For potential transformers, ratio test, insulation test, etc.
- g) Contact resistance for breaker contacts between male and female.

WIRES AND CABLES:

- a) Continuity testing of all cables.
- b) Wires and cables rated 433 volts or more shall be tested with a 1000 volts megger. Cables rated less than 433 volts shall be tested with a 500 volts megger.
- c) No wires or cable having resistance between conductors or between conductors and ground of less than 100 meg ohm shall be accepted.

FUNCTIONAL TESTING:

- a) All circuit breakers, contactors, relays, remote devices, etc., shall be checked for its operations.

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LIST OF MAKES
LIST OF APPROVED MANUFACTURERS FOR LT ELECTRICAL WORKS

NO.	MATERIALS	APPROVED MANUFACTURERS
1	Moulded Case Circuit Breaker (MCCB)	i) Legrand
		ii) L & T
		ii) Siemens
2	Switch Fuse Unit (SFU)	i) L & T
		ii) Siemens
		iii) ABB
3	Contactors	i) L & T
		ii) Siemens
		iii) Schneider
4	Meters	i) L & T
		ii) IMP
5	LT cable	i) Polycab
		ii) Finolex
		iii) Havells
		iv) CCI
6	Cable Termination	i) Dowells
		ii) Comet
7	Cable Tray	i) Profab
		ii) Metalemmms

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		iii) Asian Ancillary Corporation
8	Conduit Steel / PVC	i) Precisions
		ii) Supreme
		iii) Diamond
9	Wires	i) Polycab
		ii) Finolex
		iii) Havells
		iv) Pagoda
10	Modular Switches & Sockets with PVC Box	i) Legrand
		ii) MK
		iii) Crabtree
		iv) North-West
11	Distribution Board, MCB & ELMCB	i) Legrand
		ii) Siemens
		iii) Hager
12	Data Cable & Accessories	i) D-Link
		ii) Amp
13	Telephone cable	i) Delton
		ii) Finolex
		iii) National
14	Light Fixtures	i) Wipro
		ii) Philips
		iii) Crompton Greves
		iv) Pierlite
15	Tubes, PL's & CFL's	i) Philips
		ii) Osram
		iii) Trulite
16	Ceiling Fan	i) CG
		ii) Havells
		iii) Bajaj
		iv) Orient
17	Exhaust Fan	i) CG
		ii) Almonard

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	iii) Alstom

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