

**KANNUR MUNICIPAL CORPORATION**  
**P B No 39,**  
**Kannur,**  
**Kerala, Pin:670 001,**  
**Ph. 0497-2700141**  
**E-mail: kannurmunicipalcorporation@gmail.com**  
**Website: www.kannurcorporation.lsgkerala.gov.in**

**Date: 01/03/2019**

**e-Government Procurement (e-GP) E-TENDER NOTICE**

For and on behalf of the Superintending Engineer, Kannur Municipal Corporation invites e-tenders for the following work from eligible Bidders possessing appropriate class registration in CPWD/ State PWDS/ Government Undertakings for executing this work. Partnership firms shall furnish full names of all partners in the tender. It may, however, be signed in the partnership name by one of the partners or by a duly authorized representative, followed by the name and designation of the persons signing.

1.	Name of Work	Design, Supply, Installation, Testing & Commissioning of Semi –Automatic Puzzle Parking Multi level Car Parking facility, Internal and External Electrical installations, Fire Alarm, Fire Fighting system with Sump & OHT, Landscaping and allied works at STADIUM and BANK ROAD for Kannur Municipal Corporation under AMRUT scheme.
2.	Estimate Amount	Rs 88904817/-
3.	Earnest Money Deposit (EMD)	Rs.2,00,000/-
4.	Tender Submission Fee	Rs.11,800/- (including GST 18%)
5.	Period of completion	10 months
6.	Tender documents	Can be downloaded from the website <b>www.etenders.kerala.gov.in</b>
7.	Last date and time of Receipt of Tender/Bids	6.00 pm on 20/03/2019
8.	Date and Time of Opening of Tender	11.00 am on 22/03/2019
9.	Form of Contract	Item Rate
10.	Pre-bid Meeting Date, Time & Venue	11.00 am on 11/03/2019 Kannur Municipal Corporation

**General Tender Terms & Conditions for e-Procurement**

This tender is an e-Tender and is being published online for the Design, Supply, Installation, Testing & Commissioning of Semi –Automatic Puzzle Parking Multi level Car Parking facility,

Internal and External Electrical installations, Fire Alarm, Fire Fighting system with Sump & OHT, Landscaping and allied works at STADIUM and BANK ROAD for Kannur Municipal Corporation under AMRUT scheme. The tender is invited in 2 cover system from the registered and eligible firms through e-procurement portal of Government of Kerala (<https://www.etenders.kerala.gov.in>). Prospective bidders willing to participate in this tender shall necessarily register themselves with above mentioned e-procurement portal.

The tender timeline is available in the critical date section of this tender published in [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in).

**A). Online Bidder registration process:**

Bidders should have a Class II or above Digital Signature Certificate (DSC) to be procured from any Registration Authorities (RA) under the Certifying Agency of India. Details of RAs will be available on [www.cca.gov.in](http://www.cca.gov.in). Once, the DSC is obtained, bidders have to register on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) website for participating in this tender. Website registration is a one-time process without any registration fees. However, bidders have to procure DSC at their own cost.

Bidders may contact e-Procurement support desk of Kerala State IT Mission over telephone at 0471-2577088/188/388 or 0484-2336006, 2332262 or 0497-2764788, 2764188 or 0483-273294 or through email: [etendershelp@kerala.gov.in](mailto:etendershelp@kerala.gov.in) or [helpetender@gmail.com](mailto:helpetender@gmail.com) for assistance in this regard.

**B). Online Tender Process:**

The tender process shall consist of the following stages:

- i. **Downloading of tender document:** Tender document will be available for free download on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in). However, tender document fees shall be payable at the time of bid submission as stipulated in this tender document.
- ii. **Pre-bid meeting:** 11 am, 11/03/2019 at Kannur Municipal Corporation
- iii. **Publishing of Corrigendum:** All corrigenda shall be published on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) and shall not be available elsewhere.
- iv. **Bid submission:** Bidders have to submit their bids along with supporting documents to support their eligibility, as required in this tender document on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in). No manual submission of bid is allowed and manual bids shall not be accepted under any circumstances.
- v. **Opening of Technical Bid and Bidder short-listing:** The technical bids will be opened, evaluated and shortlisted as per the eligibility and technical qualifications. All documents in support of technical qualifications shall be submitted (online). Failure to submit the documents online will attract disqualification. Bids shortlisted by this process will be taken up for opening the financial bid.
- vi. **Opening of Financial Bids:** Bids of the qualified bidder's shall only be considered for opening and evaluation of the financial bid on the date and time mentioned in critical date's section.

**C). Documents Comprising Bid:**

- (i). **The First Stage (Pre-Qualification or Technical Cover based on 1 cover or 2 cover tender system):**

Pre-Qualification or Technical proposal shall contain the scanned copies of the following documents which every bidder has to upload:

- a) Copy of bidder's valid Registration Certificate

- b) Bid Capacity certificate of the bidder
- c) Preliminary Agreement on a Rs. 200/- stamp paper. Stamp paper charges are to be borne by the bidder himself.
- d) Scanned copy of the EMD exemption certificate, if any
- e) Power of Attorney authorized by a Notary Public, indicating that the person(s) signing the bid has the authority to sign the bid and thus that the bid is binding upon the bidder during the full period of its validity in accordance with clause 18.0.
- f) A covering letter stating any other matter in relation to his bid, which the bidder considers, should be drawn to the particular notice of the Client and the Client's Representative.
- g) Bidder's Eligibility and Qualifications:  
Details of any significant changes in the bidder's management or financial position since furnishing information when applying for pre-qualification (Failure to disclose such changes, if revealed later, may render the Contract liable for termination at the Contractor's risk and cost).
- h) Eligibility and Conformity of the Facilities  
Documentary evidence established in accordance with Client's Requirements that the works are eligible and conform to the bidding documents.

The department doesn't take any responsibility for any technical snag or failure that has taken place during document upload.

**(ii). The Second Stage (Financial Cover or as per tender cover system):**

The Bidder shall complete the Price bid as per format given for download along with this tender.

**Note:** The blank price bid should be downloaded and saved on bidder's computer without changing file-name otherwise price bid will not get uploaded. The bidder should fill in the details in the same file and upload the same back to the website.

**Fixed price:** Prices quoted by the Bidder shall be fixed during the bidder's performance of the contract and not subject to variation on any account. A bid submitted with an adjustable/ variable price quotation will be treated as non - responsive and rejected.

**D). Tender Document Fees and Earnest Money Deposit (EMD)**

The Bidder shall pay, a tender document fees of Rs. 11,200/- and Earnest Money Deposit or Bid Security of Rs. 2,00,000/-. The Bid security is required to protect the purchaser against risk of Bidder's conduct, which would warrant the forfeiture of security.

**Online Payment modes:** The tender document fees and EMD can be paid in the following manner through e-Payment facility provided by the e-Procurement system

**State Bank of India Multi Option Payment System (SBI MOPS Gateway):** Bidders are required to avail Internet Banking Facility in any of below banks for making tender remittances in eProcurement System.

<b>A) Internet Banking Options (Retail)</b>			
1	Allahabad Bank	32	Kotak Mahindra Bank
2	Axis Bank	33	Lakshmi Vilas Bank
3	Andhra Bank	34	Mehsana Urban Co-op Bank
4	Bandan Bank	35	NKGSB Co-operative Bank
5	Bank of Bahrain and Kuwait	36	Oriental Bank of Commerce
6	Bank of Baroda	37	Punjab and Maharashtra Cooperative

			Bank
7	Bank of India	38	Punjab National Bank
8	Bank of Maharashtra	39	Punjab and Sind Bank
9	Bassein Catholic Co-operative Bank	40	RBL Bank
10	BNP Paribas	41	Saraswat Cooperative Bank
11	Canara Bank	42	ShamraoVithal Cooperative Bank
12	Catholic Syrian Bank	43	South Indian Bank
13	Central Bank of India	44	Standard Chartered Bank
14	City Union Bank	45	State Bank of India
15	Corporation Bank	46	Syndicate Bank
16	Cosmos Bank	47	Tamilnad Mercantile Bank
17	DCB Bank	48	Tamilnadu Cooperative Bank
18	Dena Bank	49	The Kalyan Janata Sahakari Bank
19	Deutsche Bank	50	TJSB Bank (Erstwhile Thane Janata Sahakari Bank)
20	Dhanalaxmi Bank	51	UCO Bank
21	Federal Bank	52	Union Bank of India
22	HDFC Bank	53	United Bank of India
23	ICICI Bank	54	Vijaya Bank
24	IDBI Bank	55	YES Bank
25	Indian Bank		
26	Indian Overseas Bank		
27	IndusInd Bank		
28	Jammu & Kashmir Bank		
29	Janata Sahakari Bank		
30	Karnataka Bank		
31	Karur Vysya Bank		
<b>B) Internet Banking Options (Corporate)</b>			
1	Bank of Baroda	21	Laxmi Vilas Bank
2	Bank of India	22	Oriental Bank of Commerce
3	Bank of Maharashtra	23	Punjab & Maharashtra Coop Bank
4	BNP Paribas	24	Punjab & Sind Bank
5	Canara Bank	25	Punjab National Bank
6	Catholic Syrian Bank	26	RBL Bank
7	City Union Bank	27	ShamraoVithal Co-operative Bank
8	Corporation Bank	28	South Indian Bank
9	Cosmos Bank	29	State Bank of India
10	Deutsche Bank	30	Syndicate Bank
11	Development Credit Bank	31	UCO Bank
12	Dhanalaxmi Bank	32	Union Bank of India
13	Federal Bank	33	UPPCL
14	HDFC Bank	34	Vijaya Bank
15	ICICI Bank	35	Axis Bank
16	Indian Overseas Bank		
17	JantaSahakari Bank		
18	Jammu & Kashmir Bank		
19	Karur Vysya Bank		

During the online bid submission process, bidder shall select **SBI MOPS** option and Submit the page, to view the **Terms and Conditions** page. On further submitting the same, the e-Procurement system will re-direct the bidder to MOPS Gateway, where two options namely **SBI** and **Other Banks**\* will be shown. Here, Bidder may proceed as per below:

- a) **SBI Account Holders** shall click **SBI** option to with its Net Banking Facility., where bidder can enter their internet banking credentials and transfer the Tender Fee and EMD amount.
- b) **Other Bank Account Holders** may click **Other Banks** option to view the bank selection page. Here, bidders can select from any of the 54 Banks to proceed with its Net Banking Facility, for remitting tender payments.

*\*Transaction Charges for Other Banks vide SBI Letter No. LHO/TVM/AC/2016-17/47 – 1% of transaction value subject to a minimum of Rs. 50/- and maximum of Rs. 150/-*

Any transaction charges levied while using any of the above modes of online payment has be borne by the bidder. The supplier/contractor's bid will be evaluated only if payment status against bidder is showing “Success” during bid opening.

#### **E). SUBMISSION PROCESS:**

For submission of bids, all interested bidders have to register online as explained above in this document. After registration, bidders shall submit their Technical bid and Financial bid online on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) along with online payment of tender document fees and EMD.

For page by page instructions on bid submission process, please visit [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) and click “Bidders Manual Kit” link on the home page.

**It is necessary to click on “Freeze bid” link/ icon to complete the process of bid submission otherwise the bid will not get submitted online and the same shall not be available for viewing/ opening during bid opening process.**

**SECTION -I**  
**NOTICE INVITING TENDER (NIT)**

- 1.01 The bidder should submit the following eligibility criteria documents as PDF format in designated covers.

**Eligibility Criteria**

- i. The bidder should have completed one similar work of value not less than 80% of PAC of work in a single contract as Prime Contractor during the last seven years.  
Or  
The bidder should have completed two similar works each of value not less than 60% of PAC of work in a single contract as Prime Contractor during the last 7 years  
Or  
The bidder should have completed three similar works each of value not less than 40% of PAC of work in a single contract as Prime Contractor during the last 7years
- ii. The Contractor should have an average annual turnover not less than the PAC of the work for last three financial years (2014-15, 2015-16 & 2016-17).
- iii. The bidder should have valid Registration Certificate, PAN, GST Registration, ESI and EPF Registration.
- iv. Specialised works like Fire Fighting, Solar System and electrification works etc. shall be done through specialised agencies. The credentials of specialized agencies proposed for the above works shall be submitted along with Pre-qualification Document.

Prime Contractor means: a contractor who has a contract with the owner of a project or job and has been full responsibility for its completion.

Similar work means:

1. The bidder shall have experience in construction of Multi Level Car Parking using Semi Automated Puzzle Parking technology with own fabrication facilities.
2. For Civil and other allied works mentioned in the bid, the bidder shall have satisfactorily completed at least one work of Rs. 2 crore or two works of value Rs.1.0 crore each during last seven years prior to 31.12.2017 or he may have an associates who have satisfactorily completed similar nature of work with the above mentioned capacity during last seven years prior to 31.12.2017. The work shall include Civil, Electrical, Fire Fighting etc

(The proof of the above shall be submitted as PDF format in designated covers)

The schedule of quantities, tender drawings, specifications and commercial conditions of the Contract are appended.

- 1.02 The general information of the project is given in Annexure to this NIT. The information is only indicative. The tenderers are required to visit the site and familiarise themselves with the site conditions, nature of strata, availability of construction materials, etc., before

quoting. The drawings, general & special conditions of contract, schedule of quantities and the technical specifications may be carefully studied before they offer their prices. No claims for extra compensation over and above the quoted rates will be entertained by ACCEPTING AUTHORITY on the ground that the tenderer have misjudged site conditions, nature of strata, tender conditions or any item of tender.

- 1.03 The offer shall be valid for 60 days from the tender opening date. The firm period of a tender is the period from, the date of opening of the tender to the date upto which the offer given in the tender is binding on the bidder. The firm period is fixed as the maximum time required within which a decision can be taken on the tender and order of acceptance issued in writing to the bidder which shall not exceed two months in the normal course. The consideration of tenders and decision there on shall be completed well before the date of expiry of the firm period noted in the tender so that the letter of acceptance is sent before the expiry of the firm period. If delay is anticipated, the officer who invited the tenders shall get the consent of the lowest two bidders for extending the firm period by one month or more as required. In case the lowest or any bidder refuses to extend the firm period that tender cannot be considered. All officers concerned with the consideration of tenders, shall deal with them expeditiously to settle the contract before the expiry of the firm period.
- 1.04 After the public opening of the tenders, the information relating to the examination, Clarification, evaluation and comparison of tenders and recommendations concerning the award of Contract all shall be online.
- 1.05 Subject to ACCEPTING AUTHORITY's right to accept any tender and reject any or all tenders; the work will be awarded to the tenderer whose bid has been determined to be substantially responsive to the tender documents and who has offered the lowest Evaluated Tender Price provided further that the tenderer has the capability and resources to carry out the contract effectively.
- 1.06 Prior to the expiry of the period of validity of the tender ACCEPTING AUTHORITY will notify the successful tenderers in writing their name the sum which ACCEPTING AUTHORITY will pay to the contractor in consideration of the execution completion, operation, maintenance and guarantee of the work by the contractor as specified by the contract (hereinafter called the contract price). This letter of acceptance will constitute the formation of a contract.
- 1.07 Before commencing the work and 15 days after the letter of acceptance of the tender has been intimated to him, the tenderer shall make a performance security deposit as given in clause 1.13 of this notice and furnish the same for the proper fulfillment of the contract and shall execute an agreement for the work in required non-judicial stamp paper of value not less than Rs.200/- in the prescribed format.
- 1.08 If the tenderer fails to execute the agreement as stated above within the specified period, the earnest money deposit shall be forfeited to ACCEPTING AUTHORITY and fresh tenders called for or the matter otherwise disposed off. If as a result of such measures due to the default of the tenderer to pay the required deposit, execute the agreement or take possession of the work site, any loss to ACCEPTING AUTHORITY results, the same will be recovered from the tenderer by deducting from any amount due to him from other works or revenue recovery or by suitable course of action including legal proceedings.
- 1.09 Tenders not properly filled, mutilated with incorrect calculations or generally not complying with the conditions are susceptible to be rejected.

1.10 In the case of percentage rate contract only a single rate as an overall percentage above or below or at par with the rate given in the schedule by a single entry at the specified column of the schedule under the head quoted rate, may be made. The overall percentage rate accepted and specified in the agreement shall not be varied on any account whatever. In case of item rate tender, only the rate quoted shall be considered. In event no rate has been quoted for any item(s) leaving space both in figure(s), word(s), and amount blank, it will be presumed that the contractor has included the cost of this / these item(s) in other items and rate for such item(s) will be considered as zero and work will be required to be executed accordingly. The bidder should quote each and every items. The rate thus quoted will deemed to include the cost of all materials, labour, hire charges for all machinery's, cost of fuel, power, all leads and lifts, taxes, levies, royalties all over heads contingencies, profits, etc. and the quoted price is all inclusive. The total contract price shall also be worked out and entered in.

1.11 If the tender is made by an individual it shall be signed with his full name and his complete address shall be given. If it is made by partnership firm it shall be signed with the co-partnership name by a member of the firm who shall sign his own name and give the name and address of each partner of the firm and attach a copy of 'Power of Attorney' with the tender authorising him to sign on behalf of the other partners. A certified copy of the 'Registered Partnership Deed' shall also be submitted along with the tender. A certified copy of the registered deed shall also be submitted along with the tender. The tender should be in a sealed cover. Joint ventures are not permitted to bid.

#### 1.12 **EMD**

.01 The EMD of **Rs.2,00,000/-** shall be remitted through online payment mechanism for e-procurement system of Govt. of Kerala [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in). Bidders, who have secured exemption from individual EMD payments, need not do this except when special Earnest Money is asked to be deposited. Such EMD exemption certificate/document needs to be scanned and submitted online along with the bid, failing which, the bid shall be rejected summarily. The original EMD exemption document may have to be produced, if required, failing which, the bid shall be rejected summarily.

.02 Bidders shall remit the tender fees and EMD by using the online payment options of e-Procurement system only. As described in condition 'D' of General Terms and Conditions of E-Procurement.

.03 EMD deposited with ACCEPTING AUTHORITY will be forfeited,

i) if a bidder withdraws his bid during the period of validity specified.

ii) if the successful bidder fails within the time limit to sign the contract document or fails to furnish the required security deposit.

.04 EMD will be refunded to the Contractor after remittance of the security deposit and execution of the agreement.

#### 1.13 **PERFORMANCE SECURITY DEPOSIT**

.01 Within 15 days of issue of letter of acceptance, the Contractor should submit 5% of the Contract Value as Performance Guarantee. Of this, 50% of the Performance Guarantee shall be in the form of Treasury Fixed Deposit and the rest in the form of Bank Guarantee or Fixed Deposit from Nationalised \Scheduled Bank in favour of Executive Engineer, Kannur Municipal Corporation payable at Kannur.



- .02 In addition to Performance Guarantee, Security Deposit shall be collected by deduction from the running/final bill of the Contractors @ 2.5% of the gross amount of each running and / or final claims.
- .03 All the deposits of EMD, PERFORMANCE GUARANTEE AND SECURITY DEPOSIT will not bear any interest whatsoever.

#### **1.14 REFUND OF PERFORMANCE SECURITY DEPOSIT**

- .01 On satisfactory completion of the work and after one year from the date of completion certificate, 50% of Performance Guarantee kept in the form of Bank Guarantee will be refunded to the Contractor based on the report from the Engineer-in-Charge.
- .02 On completion of Defects Liability Period, the Engineer-in-Charge shall recommend on demand from the Contractor to refund to him the 50% of Performance Guarantee kept in the form of DD and the Security Deposit deducted from RA Bills, and the same will be refunded by the Accepting Authority provided that the Engineer-in-Charge is satisfied that there is no demand outstanding against the Contractor.

#### **1.15 STATUTORY DEDUCTIONS**

- 1.15.1 Income-tax at the rate prevailing at the time of payment will be deducted from each running account bill and final bill.
- 1.15.2 TDS on GST will be deduct as per the provisions in the GST Act.
- 1.15.3 All statutory payments in connection with the employment of the workmen for this work will be borne by the Contractor.
- 1.15.4 The Contractor is the employer of all the worker's engaged for this work and should therefore take all required registrations and pay premium correctly to labour welfare funds constituted by the Union Government and Government of Kerala from time to time as per the existing rules.
- 1.15.5 All statutory deductions shall be made from the amount eligible to the Contractor in each part bill at current rates. Any tax omitted, to be deducted in any part bill shall be deducted in the subsequent bills/final bill.
- 1.15.6 Invoices should raise in the name of Client as Kannur Municipal Corporation acts purely as an agent.

#### **1.16 QUANTUM OF WORK**

- 1.16.01 A schedule of approximate quantities for various items accompanies this tender. It shall be definitely understood that ACCEPTING AUTHORITY do not accept any responsibility for the correctness or completeness of this schedule in respect of items and quantities and this schedule is liable to alteration by deletions, deductions or additions at the discretion of ACCEPTING AUTHORITY without affecting the terms of the Contract.
- 1.16.02 ACCEPTING AUTHORITY reserves the right to increase or decrease the quantum of work at site without assigning any reason.
- 1.16.03 Variations in the quantities put to tender will not be the basis of any claim or disputes. The rates agreed by the Contractor shall hold good for any amount of variation in the quantities and no claims whatsoever will be entertained on this amount. The Contractor shall carry out all works as directed by ACCEPTING AUTHORITY at the same agreed rates.

#### **1.17 ALL INCLUSIVE RATES**

The quoted rate of Contractor must be firm and shall be inclusive of cost of transportation of material to the site and all applicable taxes including GST and duties of State Government as well as Central Government.

The rates quoted by the Contractor shall be firm throughout the Contract period and there shall be no upward revision of the rates quoted by the Contractor for any reasons whatsoever. It should be clearly understood that any claims for extra Sales Tax, Excise duty, Construction Tax or any Additional tax, Service Tax etc., shall not be entertained in any case whatsoever once the tenders are opened.

Kannur Municipal Corporation will recover any loss caused due to noncompliance of provision of GST from Contractor.

## **1.18 INTERPRETING SPECIFICATIONS**

1.18.01 In interpreting the specifications, the following order of decreasing importance shall be followed:

- a. Specification mentioned in Schedule of Quantities
- b. Unit Rate Specifications and Technical Specifications,
- c. Special Conditions of Contract,
- d. Drawings,

1.18.02 Matters not covered by the specifications given in the Contract, as a whole shall be covered by the relevant Indian Standard Codes. If such codes on a particular subject have not been framed, the decision of ACCEPTING AUTHORITY shall be final.

## **1.19 ALTERATIONS**

No alterations shall be made by the tenderer in the Notice Inviting Tender, Instructions to the Contractors, Contract form, General Conditions of the Contract, Special Conditions of Contract, drawings and specifications and if any such alterations are made or any conditions attached, the tender is liable to be rejected.

## **1.20 ACCEPTANCE OF THE TENDER**

1.20.01 The acceptance of a tender rests with the Authorised Representative of ACCEPTING AUTHORITY who does not bind himself to accept the lowest tender and reserves to himself the authority to reject any or all the tenders received without assigning any reason(s) whatsoever.

1.20.02 The authorised representative of ACCEPTING AUTHORITY reserves the right of accepting the whole or any of the tenders received and the tenderer shall be bound to perform the same at the rates quoted.

1.20.03 The work shall be carried out under the direction and supervision of ACCEPTING AUTHORITY or their representative at site. On acceptance of the tender, the Contractor shall intimate the name of his accredited representative who would be supervising the construction and would be responsible for taking instructions for carrying out the work.

1.20.04 ACCEPTING AUTHORITY's decision with regard to the quality of the material and workmanship will be final and binding, any material rejected thus shall be immediately removed by the Contractor and replaced by materials as per specifications and standards.

## **1.21 DEFECTS LIABILITY PERIOD**

Defect Liability Period will be 1 years from the date of completion of work. Any defect developed within 'Defect Liability Period' will have to be rectified by the Contractor at their own cost and in case the defects are not rectified by the Contractor, ACCEPTING AUTHORITY or their representative shall get the work done at the risk and cost of the Contractor.

## **1.22 DELAYS IN COMMENCEMENT**

The Contractor shall not be entitled to any compensation for any loss suffered by him 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.

## **1.23 OCCUPATION IN PART & CO-OPERATION**

1.23.01 If ACCEPTING AUTHORITY wants to occupy areas in part, the Contractor shall complete the work of these areas in conjunction with ACCEPTING AUTHORITY and hand over the same to ACCEPTING AUTHORITY without affecting any of the clause of Contract agreement.

1.23.02 The Contractor must co-operate and co-ordinate with other Contractors involved in other works at the site. The Contractor should also note that they shall have to clear the site of vegetation, debris, etc. before the commencement of the work and that no extra payment is permissible on this account.

## **1.24 ISSUE OF MATERIALS, TOOLS AND PLANT**

1.24.01 The Contractor should inspect the source of materials, their quality, quantity and availability. All materials must strictly comply with the relevant B.I.S. specifications.

1.24.02 ACCEPTING AUTHORITY shall issue the following material or Tools and Plants required for the execution of the works.

- a) Materials **Nil**
- b) Tools and Plants **Nil**

## **1.25 PERIOD OF CONSTRUCTION**

Time is the essence of this contract. The construction period shall **be 10 months**. Commencement of the work shall be considered from the date of receipt of letter of acceptance and handing over possession of the site. The Contractor shall draw a detailed schedule of program on whole work in the form of a Bar Chart within one week of award of work and submit to the Consultants for their approval.

## **1.26 INSURANCE**

The successful tenderer shall take out Contractor's All Risk (CAR) insurance policy, jointly in the name of ACCEPTING AUTHORITY and the Contractor, and the original policy shall be deposited with ACCEPTING AUTHORITY.

1.27 This Notice Inviting Tender will form part of the tender document and the agreement executed by the successful tenderer.

1.28 **The format for information about the tenderer attached in special conditions of contract and tender form in NIT shall be duly filled by the tenderer and should upload the same as pdf format.**

**Executive Engineer  
Kannur Municipal Corporation  
SD/-**

## ANNEXURE TO NIT

### GENERAL INFORMATION OF THE PROJECT

1. Name of Project : Design, Supply, Installation, Testing & Commissioning of Semi –Automatic Puzzle Parking Multi level Car Parking facility, Internal and External Electrical installations, Fire Alarm, Fire Fighting system with Sump & OHT, Landscaping and allied works at STADIUM and BANK ROAD for Kannur Municipal Corporation under AMRUT scheme.
2. Site and location : 1. Jawaharlal Nehru Stadium, Opposite Railway north Gate, Kannur  
2. Peethambara Park, BANK road, Kannur
3. Nature/scope of work : Construction
4. Nearest Railway Station : Kannur
5. Nearest Airport : Calicut International Airport
6. Owner/Client : Kannur Municipal Corporation
7. Consultants : KITCO Ltd.,  
P.B.No.4407,  
Femith's, Puthiya Road,  
NH By Pass,  
Kochi – 682 028.
8. Accepting Authority : Kannur Municipal Corporation,  
P B No 39,  
Kannur,  
Kerala, Pin:670 001,  
Ph. 0497-2700141.
9. Payment Authority : Kannur Municipal Corporation.,  
P B No 39,  
Kannur,  
Kerala, Pin:670 001,  
Ph. 0497-2700141.
10. Period of completion of work : As per NIT
11. Data & Schedule taken : CPWD Delhi Schedule of Rates 2016 with  
a cost index 38.24%

### TENDER FORM

**TENDER NO:** .....

To

Accepting Authority

Dear Sirs,

**Sub: Design, Supply, Installation, Testing & Commissioning of Semi –Automatic Puzzle Parking Multi level Car Parking facility, Internal and External Electrical installations, Fire Alarm, Fire Fighting system with Sump & OHT, Landscaping and allied works at STADIUM and BANK ROAD for Kannur Municipal Corporation under AMRUT scheme.**

With reference to the tender invited by you for the above proposed work, I/We do hereby Tender for the same after having:

- a) Examined the designs, drawings, details, specifications and schedule of quantities, instructions to tenders, agreement and the conditions of contract annexed thereto (hereinafter called the Contract Documents).
- b) Visited the site of work, studied the site conditions, nature of strata, availability of construction materials etc., and
- c) Acquired the requisite information on all prevailing factors affecting the tender.

I/We undersigned hereby offer to construct the proposed work in strict accordance with the Contract document for the consideration to be calculated in terms of the priced schedule of quantities.

I/We have noted that time is the essence of the contract and ready to undertake and complete the whole of the works as per the attached schedule from the date of issue of an intimation by you that our tender has been accepted and upon receiving possession of site. I/We further undertake that on failure subject to the conditions of the contract relating to extension of time, I/We are willing to pay the agreed Liquidated Damages/Penalty for the period during which the work remains incomplete beyond the due date of completion.

I/We further agree to the deduction of performance security deposit mentioned in NIT which will be returned to me/us as per the relevant clauses in the agreement. The deduction will be as explained in Notice Inviting Tender.

I/We undertake to execute the work of electrification of various facilities if any, through a licensed electrical contractor of appropriate class as given in the tender condition. All the requirements of supervision, testing, commissioning and energizing will be fulfilled by us.

We have also executed the preliminary agreement, which is enclosed.

Further we undertake to execute the works which will be entrusted to us in the most workman like manner within the stipulated completion period. If our Tender is found acceptable, we agree to enter into a contract as specified by you within one week of the receipt of intimation of acceptance of our tender.

Our Bankers are:

1.....

2.....

Place:

Date :

Signature of bidder

Name of the partners of the firm

OR

Name of the person having power of Attorney to sign the contract.

Postal Address :

Telephone Number

i) Land :

ii) Mobile :

iii) Email :

iv) Income Tax PAN No. :

v) GST TIN :

ADDENDUM

TECHNICAL REQUIREMENTS section 5.3 under TECHNICAL SPECIFICATION MLCP should be read as below:

Previous	Corrected
The MLCP system proposed at Putharikandam consists of Puzzle parking system with 4 units of Six Level Six Grid (Type-1) and 2 units of Six Level Eight Grid ((Type-2) over-ground Puzzle Parking System with Electro Mechanical technology to accommodate minimum of 31 Cars Per Type - 1 unit and 43 Cars per type-2 unit and in total minimum 210 car spaces	The MLCP system proposed consists of Puzzle parking system with 4 units of Six Level Six Grid (Type-1) at Stadium and 1 unit of Six Level Six Grid (Type-1) at Bank road with Electro Mechanical technology to accommodate minimum of 31 Cars Per Type - 1 unit and in total minimum 155 car spaces



## **2.00 GENERAL CONDITIONS OF CONTRACT**

### **2.01 Definitions**

In the contract (as hereinafter defined) the following words and expressions shall have the meaning hereby assigned to them except where the contract otherwise requires.

The “OWNER/CLIENT” shall mean the Corporation/Board/Department/Person for whom the work is being arranged.

The ACCEPTING AUTHORITY shall mean the Accepting Officer/Firm with whom the Contractor executes the Agreement and this shall be mentioned in NIT.

The “CONTRACTOR” shall mean person or persons, firm or company whose tender has been accepted and includes the contractor’s legal representatives, successors and permitted assigns.

The “CONSULTANTS” shall mean KITCO Ltd. who are consultants to the Owner for this project and having their office at P.B.No.4407, Femith’s, Puthiya Road, NH By Pass, Vennala, Kochi-28, for the present or any other competent agency duly appointed by OWNER/CLIENT to act as consultants for the purpose of the contract. The words “Consultants” “Consulting Engineers” appearing elsewhere in the tender shall also mean consultants.

“TENDER” shall mean the tender submitted by the contractor for acceptance before the ACCEPTING AUTHORITY.

The “WORK” shall mean and include all works to be executed in accordance with the contract or part thereof as the case may be and shall include all extras, additional, altered or substituted works required for the purpose of the contract.

The “CONTRACT DOCUMENT” shall mean the agreement between ACCEPTING AUTHORITY and the contractors for the execution of the work including therein all documents such as the Notice Inviting Tender, Tender Forms, General Conditions of Contract, Technical Specification, Schedule of Quantities, Special Conditions of Contract, Letter of Acceptance, Agreed variation if any, drawings, work orders, and / or any other / correspondences or negotiations, etc.

“SPECIFICATIONS” shall mean all directions, Descriptions of the item in the schedule of quantities, various technical specifications, provisions and requirements attached to the contract which pertain to the method and manner of performing the work, and the materials to be furnished under the contract for the work as may be amplified or modified by ACCEPTING AUTHORITY/CONSULTANT, drawings for the performance of the contract in order to provide the unforeseen conditions or in the best interest of the work. It shall also include the latest revised version of the relevant B.I.S. specification and other relevant codes.

“SITE” shall mean the land allotted by the Owner/Client under in or through which the work is to be carried out.

“LETTER OF ACCEPTANCE/AWARD OF WORK” shall mean an intimation by letter, telegram, telex or fax to the tenderer that the tender has been accepted in accordance with the provisions contained therein.

“ENGINEER/ENGINEER-IN-CHARGE” shall mean the Engineering Personnel representing ACCEPTING AUTHORITY/CONSULTANT and entrusted with work of supervision of work at the site.

“CONTRACT VALUE /PRICE” shall mean the total amount quoted in the Price Bid and accepted by ACCEPTING AUTHORITY including tender below/excess.

The ‘PROBABLE AMOUNT OF CONTRACT’ (PAC) shall mean the Estimated amount/ Tendered amount of the work.

The “PAYMENT AUTHORITY” shall mean the Officer/Firm who makes payments of the bills for the work done as mentioned in NIT.

## 2.02 **SITE**

Location and details of site are specified in NIT.

Entry into the project area will be restricted. If required passes and permits will have to be obtained from Owners for entry of all persons and vehicles into the project area. During working, the contractor shall provide barricades and working place shall be isolated from other places. Working place shall be visible from other areas.

## 2.03 **SCOPE OF WORK**

The scope of work is described in the NIT.

The scope of work further includes variation or modification of design, quantity or quality of work, addition, omissions or substitution of any work, under the written instruction of Engineer-in-Charge. Such instructions shall be complied forthwith.

The Contractor shall provide all necessary labour, materials, equipments and management and supervisory personnel to complete the works provided under this contract in time.

## 2.04 **GENERAL OBLIGATIONS**

### 2.04.01 **INSPECTION OF SITE ETC. BEFORE SUBMISSION OF TENDER**

The Contractor shall inspect and examine the site and its surroundings, and shall satisfy himself before submitting his tender, as to the nature of the ground, form and nature of the site, the quantities and nature of work and materials and its availability required for the completion of the works, the means of access to the site, the local labour conditions, the accommodation he may requires and in general shall obtain all necessary information as to the risks, contingencies and other circumstances which may influence or affect his tender. He must go through all the drawings, specifications and other tender documents. Any further clarifications in the drawings and documents can be had from ACCEPTING AUTHORITY at the above mentioned address.

#### 2.04.02 **SUFFICIENCY OF TENDER**

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices stated in the priced schedule of quantities and the schedule of rates and prices, if any, with tender rates and prices shall cover all his obligations under the contract and all matters and things necessary for the proper completion and maintenance of the work.

#### 2.04.03 **DISCREPANCY OR ERROR IN TENDER DOCUMENT**

Should the Contractor notice any discrepancy or error in the tender document, in the specification, conditions of contract or quantities or units shown against items or any other part of the tender document, he shall immediately bring to the notice of ACCEPTING AUTHORITY and obtain the clarification before submitting the tender. The tender shall be based on such clarifications received and shall be recorded as such in the covering letter to the tender, failing which ACCEPTING AUTHORITY shall have the right to ask the Contractor to execute the work according to the corrected statement made or quantities or units shown in the tender, without any compensation; when the same has come to the notice of the ACCEPTING AUTHORITY.

#### 2.04.04 **RATES QUOTED FOR FINISHED WORK**

The rates quoted in the tender by the Contractor must be for the finished work as per the drawings and specifications.

#### 2.04.05 **LOCATION OF WORK**

Unless specifically mentioned in the item, the work described there-in may be at any location or elevation.

#### 2.04.06 **FIRM PERIOD**

The tender shall remain open for acceptance for a period of **60 days** from the date of opening of the tender. If any tenderer withdraws his tender before the said period or makes any modifications in terms and conditions of the tender, then Accepting Authority has the liberty to forfeit the said Earnest Money Deposit.

#### 2.04.07 **COMMENCEMENT OF WORK**

The Contractor shall commence the work at site, within 15 days from the date of receipt of letter of award of work or handing over of the site whichever is later or as mentioned in the letter of award of work and shall proceed with the same with due expedition.

#### 2.04.08 **PROGRAMME OF WORK**

As per the clause in special conditions of contract.

#### 2.04.09 **CONTRACTOR'S EMPLOYEES**

The Contractors shall provide and employ sufficient qualified personnel at site for the project management.

Only such technical assistants are skilled and experienced in their respective fields and such-agents, foreman and leading hands as are competent to give proper supervision to the work they are required to supervise and, such skilled, semi-skilled and un-skilled labour as is necessary for the proper and timely execution and maintenance of works.

## **2.05 ASSIGNMENT AND SUB-CONTRACTING**

### **2.05.1 ASSIGNMENT**

The contractor shall not assign the contract or any part thereof or any benefit or interest therein or thereunder without the written permission of ACCEPTING AUTHORITY; not shall transfers be made by Power of Attorney authorizing others to carry out the work or receive payment on behalf of the tenderer.

### **2.05.2 SUB-CONTRACTING**

The Contractor shall not sublet any portion of the contract.

## **2.06 REMOVAL OF WORKMEN**

ACCEPTING AUTHORITY shall be at liberty to object to and require the Contractor to remove forthwith from the works any person employed by the Contractor in or about the execution or maintenance of the works who in the opinion of ACCEPTING AUTHORITY misconduct himself or is incompetent or negligent in the proper performance of his duties or whose employment is otherwise considered by ACCEPTING AUTHORITY to be undesirable and such person shall be replaced by the Contractor without delay by a competent substitute approved by ACCEPTING AUTHORITY.

## **2.07 COMMUNICATIONS TO BE IN WRITING**

All references, communications, correspondences made by ACCEPTING AUTHORITY/ Engineer-in-Charge or the Contractor concerning the works shall be in writing and no reference, communication, or complaint which is not in writing, shall be recognised.

## **2.08 DRAWING**

### **2.08.01 ISSUE OF DRAWINGS**

The drawings accompanying the tender document are of indicative nature and issued for tendering purpose only and with the purpose to enable the tenderer to make an offer in line with the requirements of the CLIENT. Design, Supply, Installation, Testing and commissioning of MLCP is in the contractor scope and shop drawings have to prepared and vetted from Government approved agency and submitted before the scheduled execution to ACCEPTING AUTHORITY. The work should be executed as per the vetted shop drawing and manufacturers detailed technical specification after the approval from ACCEPTING AUTHORITY. The Contractor shall give a notice well in advance in writing to ACCEPTING AUTHORITY/ Engineer-in-Charge or his representative of any further drawings or specifications of clarification that may be required for the execution of the works or otherwise under the contract.

#### **2.08.02 COPIES OF DRAWINGS TO BE KEPT AT SITE**

One copy of the drawings furnished to the Contractor shall be kept at the site and the same shall at all reasonable times be available for inspection and use by Engineer-in-Charge or any other person authorised by ACCEPTING AUTHORITY in writing.

#### **2.08.03 ISSUE OF FURTHER DRAWINGS AND INSTRUCTIONS**

ACCEPTING AUTHORITY/ENGINEER-IN-CHARGE shall have full power and authority to issue to the Contractor from time to time through his representative, during the progress of the works such further drawings and instructions as shall be necessary for the purpose of proper and adequate execution and maintenance of the works and the Contractor shall carry out and be bound by the same.

#### **2.08.04 OWNERSHIP OF DRAWINGS**

All drawings supplied to the Contractor are deemed to be the property of ACCEPTING AUTHORITY. The Contractor should not divulge or use, except for the purpose of this contract, any information contained in the drawings.

#### **2.08.05 EXECUTION AS PER DRAWINGS**

The Contractor must not vary or deviate from the drawings in any respect while executing the work or executing any extra work of any kind whatsoever unless authorised by Engineer-in-Charge.

#### **2.08.06 PLANS AND DRAWINGS TO BE SUBMITTED BY CONTRACTOR**

The Contractor shall submit the following information in triplicate to ACCEPTING AUTHORITY for approval within the time stipulated: each item below:-

- a) A general tentative layout plan of site office, material, storage yard construction plant and equipments access/internal roads required for the execution of work within 15 days from the date of receipt of work order.
- b) Layout and details of temporary works that the contractor wants to carry out to fulfill his obligation under the contract. Within 15 days ACCEPTING AUTHORITY/ Engineer-in-Charge will give their approval/comments sufficient to proceed with the work or objections/instructions to the Contractor based on which the drawings shall be revised and submitted again for approval by the Contractor.
- c) All these plans and drawings submitted by the Contractor and approved by ACCEPTING AUTHORITY/ Engineer-in-Charge shall become part of the contract.

#### **2.08.07 FABRICATION DRAWINGS**

Contractor shall prepare at his own cost all fabrication drawings of all structural steel works and bar bending schedule for R.C.C. works and submit them to Engineer-in-Charge for their approval at least before 15 days of commencing the fabrication. All

the details like sizes, capacities, dimensions, arrangement of fabrication, etc. should be clearly indicated on these drawings.

#### **2.09 ROYALTIES AND PATENT RIGHTS**

All royalties or other sums payable in respect of the supply and use in carrying out the work as desired by or referred to in the schedule of quantities of any patented articles, process or inventions shall be deemed to have been included in the contract sum and the Contractor shall indemnify ACCEPTING AUTHORITY from and against all claims, proceedings, damages, costs and expenses which may be brought or made against ACCEPTING AUTHORITY 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, process and inventions.

#### **2.10 OCCUPATION AND USE OF LAND**

No land, building belonging to or in the possession of the Owner/Client/ Consultant shall be occupied by the Contractor. The Contractor shall not use, or allow to be used, the site for any purpose other than that for executing the works.

#### **2.11 CONTRACTOR'S STORE AND SITE OFFICE**

Any facility, proposed to be temporarily constructed by the Contractor for his office work, storage of materials, etc. shall conform to the standard sketch, or to the plan approved by ACCEPTING AUTHORITY. Permission for the construction of such facility shall be obtained in writing. Suitable area in the site of work shall be allowed to the contractor free of cost for constructing the temporary facility. However, the required structure shall be provided by him at his own expense and he shall be solely responsible for guarding his property with requisite insurance against theft, fire, etc. The contractor however will have to dismantle facility and clear the land of all debris, etc. at his own expense after completion of work.

#### **2.12 MATERIALS, TOOLS AND PLANT**

All materials, tools and plants required for the execution of the works other than those mentioned in the Tender shall be supplied by the Contractor. Permanent materials so supplied shall have the approval of Engineer-in-Charge before using on the works. All the rejected materials shall be removed at once from the site of work at the Contractor's own cost.

#### **2.13 TOLLAGES, ETC.**

The Contractor shall pay all tollages and other royalties, rent and other payments or compensations, if any, for getting all materials required for the works.

#### **2.14 SETTING OUT**

The Contractor shall be responsible for the true and proper setting out of the works and for the correctness of the position, levels, dimensions and alignment of all parts of the works and for the provision of all necessary instruments, appliances and labour in connection therewith. If at any time during the progress of the works any error shall appear or arise in the position, level, dimensions or alignment of any part of the works,

the Contractor on being required to do so by ACCEPTING AUTHORITY/ Engineer-in-Charge shall at his own cost rectify such error to the satisfaction of ACCEPTING AUTHORITY/ Engineer-in-Charge. The checking of any setting out or of any way relieve the Contractor from the responsibility of true and proper setting out of the works. The Contractor shall provide all necessary instruments, appliances and labour required by ACCEPTING AUTHORITY/ Engineer-in-Charge for checking if any, of the setting out. The Contractor shall carefully protect and observe all bench marks, site levels, pegs and other things used in setting out the works. The rates quoted for the work shall also include the cost of reference and level pillars and other dismantling, when no longer required.

#### **2.15 DAMAGE TO PERSONS AND PROPERTY**

The Contractor shall indemnify and keep indemnified Engineer-in-Charge/ Client/Owner against all losses and claims for injuries or damages to any person or property whatsoever which may arise out of or in consequence of the construction and maintenance of works and against all claims, demands proceedings, damages, costs, charges, expenses, whatsoever in respect thereof in relation thereto.

#### **2.16 CO-OPERATION WITH OTHER AGENCIES**

The Contractor shall co-operate with the work of other agencies or Contractors that may be employed or engaged by ACCEPTING AUTHORITY/ CONSULTANT and as far as it relates to the Contractor's work. The sequence of work shall be so arranged that the work of other agencies are also in progress simultaneously.

#### **2.17 BARRICADING AROUND EXCAVATED TRENCHES, ETC.**

The Contractor shall at his own cost provide, around excavation, temporary barricading with bellies and bamboo with warning signals during day and night and shall maintain it so long as the trenches/pits are not filled up. Similar barricades shall also be provided in the area all dismantling work, erection of structure, sheeting work, etc. No extra claim shall be entertained for providing, maintaining and removing such barricades.

#### **2.18 PROTECTION OF UNDERGROUND SERVICES**

The contractor must take precautionary measures to protect the underground and other services lines viz. Cables, water and sewer lines, etc. and observe any specific instructions which may be given in this regard by Engineer-in-Charge.

#### **2.19 DEWATERING TRENCHES AND PITS**

The tendered rates shall always be deemed to have taken into account the cost of removal of silt and materials that may slip in the trenches and pits and dewatering the trenches or pits of water accumulated or collected through seepage or subsoil water or rain water. The contractor shall in no case be entitled to claim any extra amount for the above work. The contractor shall remain prepared with necessary pumps and equipment for dewatering the trenches or pits so as to avoid unnecessary delay and possible damage to the property, etc.

**2.20 WORK IN OR AROUND OPERATING PLANT OR OFFICES ETC.**

Where the work is being carried out in or around an operating plant where the plant must run uninterrupted, the contractor shall work only at specified place and times as mutually arranged between the Contractor and Engineer-in-Charge. Similar arrangement must be made while executing works inside the offices, buildings, etc. without causing disturbance to the office work. For this the work may be required to be done during off-hours and Sundays. No addition amount will be allowed beyond the rates quoted for doing work in the manner described above.

**2.21 WORK IN SHIFTS AND ON OFF-DAYS**

The Contractor shall work in one or more shifts as also on Sundays and off days to complete the work on time, if so required by ACCEPTING AUTHORITY for which ACCEPTING AUTHORITY shall not be liable to pay any extra. If instructed by Engineer-in-Charge, the Contractor should carry out the work in the night also.

**2.22 SITE ORDER BOOK AND CEMENT REGISTER**

A site order book must be maintained and always be available at site to record the instructions by Engineer-in-Charge. The Contractor must see that the instructions noted therein are properly carried out.

A register showing the stock, receipts, daily issue/consumption of cement and balance quantity available etc. should be maintained at site and made available on demand by the Engineer-in-Charge.

**2.23 DELAY IN OBTAINING MATERIALS SUPPLIED BY ACCEPTING AUTHORITY**

If ACCEPTING AUTHORITY has undertaken to supply any material specified in the special conditions at rates and conditions cited therein, the contractor shall keep himself in touch with day-to-day position regarding the supply of materials from ACCEPTING AUTHORITY and adjust the progress of the works in such a way that labour may not remain idle nor there by any other claim due to or arising from delay in obtaining the materials.

**2.24 RECORD OF MATERIALS SUPPLIED BY ACCEPTING AUTHORITY**

The contractor shall maintain an account of different materials obtained from ACCEPTING AUTHORITY for executing the works under the contract. ACCEPTING AUTHORITY/ Engineer-in-Charge shall have the right to check the position of materials at all times.

**2.25 SAFE STORAGE OF MATERIALS**

The contractor shall be responsible for the safe storage of materials supplied by ACCEPTING AUTHORITY for executing of the works. Materials lost or damaged or unaccounted for or made unserviceable by the Contractor shall be charged at penal rates.



## **2.26 TRANSPORT OF MATERIALS**

Unless otherwise specified, all the materials supplied by ACCEPTING AUTHORITY shall be transported by the Contractor from ACCEPTING AUTHORITY's store/yard, to the site of work at no extra cost.

## **2.27 SITE TO BE KEPT CLEAN**

The surplus spoil and dismantled debris shall be removed to a place as directed by Engineer-in-Charge and stacked, levelled and dressed as directed. Rehandling charges will not be allowed.

## **2.28 CONFLICT IN MEANING BETWEEN SCHEDULE OF QUANTITIES AND SPECIFICATIONS**

The schedule of quantities shall be read in conjunction with the specification, and in the event of conflict in meaning between the two, the meaning of the item in the schedule of quantities shall always have precedence over the technical specifications.

## **2.29 LABOUR**

### **2.29.01 LABOUR RULES**

In respect of all labour directly or indirectly employed on the works by the Contractor, the Contractor shall comply with the provisions of the contract labour (Regulation and Abolition) Act 1970, Minimum Wages Act 1948, Payment of Wages Act 1936, Employees Provident Funds and Miscellaneous Provision Act 1952, The Employees State Insurance Act, 1948 and any amendments thereof and all legislation and rules of the State and/or Central Government or other local authorities, framed from time to time, governing the protection of health, sanitary arrangements, wages, welfare and safety for labour employed on building and construction works and for bonus, retirement benefits, retrenchment/lay off, compensation and all other matter liabilities of ACCEPTING AUTHORITY to employees. The rules and the other statutory obligations with regard to fair wages, welfare and safety measures, maintenance of register, etc. will be deemed to be part of the contract. The contractor shall produce documentary evidence for compliance of above Acts.

### **2.29.02 REPORTING ACCIDENT OF LABOUR**

The Contractor shall be responsible for the safety of all employees and/or workers employed or engaged by him on and in connection with the works and shall forthwith report all cases or accidents to any of them, however caused and whenever occurring, to ACCEPTING AUTHORITY/ Engineer-in-Charge and shall make every arrangement to render all possible assistance and aid to the victims of the accident.

### **2.29.03 PROVISION OF WORKMEN'S COMPENSATION ACT**

The Contractor shall at all times indemnify and keep indemnified ACCEPTING AUTHORITY against all claims for compensation under the provisions of the workmen's Compensation Act 1923 or any other law for the time being in force by or in respect of any workmen employed by the Contractor in carrying out the contract and against all cost and expenses or penalties incurred by ACCEPTING AUTHORITY in

connection therewith. In any case by virtue of the provision of the said act, ACCEPTING AUTHORITY is obliged to pay compensation to a workman employed by the Contractor in executing the works, ACCEPTING AUTHORITY shall recover from the Contractor the amount of the compensation so paid and without prejudice to the rights of ACCEPTING AUTHORITY under the said Act. ACCEPTING AUTHORITY shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any amount due to the Contractor, whether under this contract or otherwise without prejudice to any other remedy that may be available to ACCEPTING AUTHORITY, in law. ACCEPTING AUTHORITY shall not be bound to contest any claim made against under the said Act, except on the written request of the Contractor and upon his giving to ACCEPTING AUTHORITY full security for all cost for which ACCEPTING AUTHORITY might become liable in consequence of contesting such claim.

#### **2.29.04 ACCIDENT OR INJURY TO WORKMEN**

ACCEPTING AUTHORITY shall not be liable for, in respect, or any damages or compensation payable as per regulations or in consequence of any accident or injury to any workmen or other person in the employment of the Contractor shall indemnify and keep indemnified ACCEPTING AUTHORITY against all such damages and compensation and against all claims, demands, proceedings costs, charges and expenses whatsoever in respect thereof or in relation thereto.

#### **2.29.05 PRESERVATION OF PEACE**

The Contractor shall take requisite precautions to prevent any riotous or unlawful behaviour by or amongst the workmen and/or others employed on the works by the contractor, for the preservation of peace and protection of the inhabitants and security of property in the neighbourhood of the works.

#### **2.29.06 AGE LIMIT OF LABOUR**

The age limit for employment of labour shall be in strict accordance with the prevailing labour legislation.

#### **2.29.07 RETURN OF LABOUR EMPLOYED**

The Contractor, if required by ACCEPTING AUTHORITY, shall submit return in detail in such form and at such interval as ACCEPTING AUTHORITY may prescribe showing number of different classes of labour employed on the work from time to time by the Contractor.

### **2.30 MATERIAL TESTS AND WORKMANSHIP**

#### **2.30.01 QUALITY OF MATERIALS, WORKMANSHIP AND TESTS**

All materials and workmanship shall be of the respective kinds described in the contract and in accordance with ACCEPTING AUTHORITY or Engineer-in-Charge instructions and shall be subject, from time to time, to such tests as ACCEPTING AUTHORITY or Engineer-in-Charge may direct at the place or any of such places. The contractor shall provide required assistance, instruments, machines, labour and materials, as normally required for examining, measuring and testing any work and the

quality, weight or quantity of any material used and shall supply samples of materials before incorporation in the works for approval as may be required by ACCEPTING AUTHORITY.

#### **2.30.02 CONSTRUCTION OF PROTOTYPES OR SAMPLES OF WORK**

The Contractor shall construct prototypes or samples of work as laid down in the contract or as instructed by Engineer-in-Charge. Such prototypes or samples or work, after approval by ACCEPTING AUTHORITY, shall serve as the standards to be achieved in the final construction.

#### **2.30.03 COST OF SAMPLES/ PROTOTYPES**

All Samples/Prototypes shall be supplied by the Contractor at his own cost.

#### **2.30.04 COST OF TESTS**

The cost of making any test as per specifications shall be born by the Contractor, and the Contractor should arrange for all facilities like meters, instruments as required for carrying out such tests.

#### **2.30.05 INSPECTION OF OPERATION**

ACCEPTING AUTHORITY/ Engineer-in-Charge shall at all times have access to the works and to the site and to all workshops and places where materials, manufactured articles or machinery are being obtained for the works and the Contractor shall arrange every facility for every assistance in obtaining the right to such access.

#### **2.30.06 EXAMINATION OF WORK BEFORE COVERING UP**

No work shall be covered up or put out of view without the approval of ACCEPTING AUTHORITY or Engineer-in-Charge and the Contractor shall arrange full opportunity to ACCEPTING AUTHORITY or Engineer-in-Charge to examine and measure any work which is about to be covered up or put out of view and to examine them before permanent work is placed thereon. The contractor shall give due notice to Engineer-in-Charge wherever any such work or foundations is or are ready or about to be ready for examination and Engineer-in-Charge shall without unreasonable delay, unless he considers it unnecessary and advise the Contractor accordingly, or attend for the purpose of examining and measuring such work.

#### **2.30.07 UNCOVERING AND MAKING OPENINGS**

The Contractor shall uncover any part of parts of the works or make opening in or through the same as ACCEPTING AUTHORITY may, from time to time, direct and shall reinstate and make good such part or parts to the satisfaction of ACCEPTING AUTHORITY. If any such part of parts have been covered up or put out of view and found to be executed in accordance with the contract, the expenses of uncovering, making openings in or through, reinstating and making good the same shall be borne by Engineer-in-Charge but in any other case all such expenses shall be borne by the Contractor and shall be recoverable from him by Engineer-in-Charge and deducted by Engineer-in-Charge from any money due, which may become due to the Contractor,

without prejudice to any other remedy that may be available to Engineer-in-Charge, by law.

#### **2.30.08 REMOVAL OF IMPROPER WORK AND MATERIALS**

Engineer-in-Charge shall during the progress of the works have power to order the following in writing from time to time for which no extra payment will be made to the Contractor.

- a) The removal from the site within such time or times as may be specified in the order of any materials which in the opinion of Engineer-in-Charge are not in accordance with the contract.
- b) The substitution of proper and suitable materials.
- c) The removal and proper re-execution notwithstanding a previous test thereof or interim payment thereof of a work which in respect of materials or workmanship is not in the opinion of Engineer-in-charge or his representative in accordance with contract.

#### **2.30.09 SUSPENSION OF WORK**

The Contractor shall, on the written order by ACCEPTING AUTHORITY suspend the progress of the works or any part thereof for such time or times and in such manner as ACCEPTING AUTHORITY may consider necessary and shall during such suspension, properly protect and secure the work, so far as is necessary in the opinion of ACCEPTING AUTHORITY.

### **2.31 TIME OF COMPLETION AND TAKING OVER**

#### **2.31.01 POSSESSION OF SITE**

Save in so far the contract may prescribe the extent of portions of the site of which ACCEPTING AUTHORITY is to be given possession from time to time and the order in which such portions will be available to him and subject to any such portions will be available to him and subject to any requirement in the contract as to the order in which the work shall be executed, ACCEPTING AUTHORITY shall give to the Contractor possession of so much of the site as may be required to enable the Contractor to commence with such reasonable proposals of the Contractor as he will make in writing to ACCEPTING AUTHORITY and shall, from time to time as the work proceeds give the Contractor possession of such further portions of the site as may be required to enable the Contractor to proceed with the construction of the works in accordance with the said programme or proposal.

#### **2.31.02 TIME OF COMPLETION**

Time is deemed to be the essence of this contract and the whole of the works shall be completed within the time stipulated or within such extended time as has been allowed as mentioned in the contract.

**2.31.03 EXTENSION OF TIME OF COMPLETION DUE TO EXTRA/ ADDITIONAL WORKS**

Should the amount of extra or additional work of any kind or changes in scope of work or other special circumstances of any kind whatsoever which may occur, be such as fairly to justify the Contractor's request for extension of time for the completion of the works, the Consultants shall determine the amount of such extension and with the approval of the CLIENT/ENGINEER-IN-CHARGE/ACCEPTING AUTHORITY shall intimate the Contractor in writing provided that the ENGINEER-IN-CHARGE/ACCEPTING AUTHORITY is not bound to take into account any extra or additional work or other special circumstances unless the Contractor has within 28 days, after such work has been commenced or such circumstances have arisen, submit to the Consultants full and detailed particulars of any request for the extension of time to which he may consider to be justified. The Contractor is bound to complete the work at the same rates, terms and conditions during the extended time of contractor.

**2.31.04 EXTENSION OF TIME OF COMPLETION DUE TO FORCE MAJEURE CONDITIONS**

If in the opinion of the ENGINEER-IN-CHARGE/ACCEPTING AUTHORITY the progress of the work has at any time been delayed due to force majeure conditions like strikes, fire, inclement weather, un-avoidable causalities, acts of god or any cause whatsoever beyond the control of the Contractor, continuously for more than one month, then the time of completion of the work may be extended for such reasonable time as the Consultants may decide and this will be indicated in writing. The Contractor shall complete the work at the accepted rates, terms and conditions. Even, if such extension of time is granted.

**2.31.05 FINES FOR EXTENSION OF TIME OF COMPLETION.**

The contractor is bound to complete the work within the stipulated period as per the agreement. When the contract period has to be extended wholly or partly due to default on part of the contractor, the Accepting Authority may sanction extension of time after imposing fine prescribed as follows:

Period	Rate of fine
First extension	1% of the PAC subject to a minimum of Rs.1000/- and maximum of Rs.50,000/-
Beyond First extension	2% of the PAC subject to a minimum of Rs.2000/- and maximum of Rs.1,00,000/-

**2.31.06 LIQUIDATED DAMAGES**

If the contractor fails to maintain the required progress as per conditions of contract or to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the law to the Accepting Authority on account of such breach, pay to the employer as liquidated damages an amount calculated @ 0.1% (zero point one percent) of the contract price of the work for every week of delay subject a maximum of 10% of the contract price.

### 2.31.07 **WORK TREATED AS COMPLETE**

The works shall not be treated as complete until:

- i) The site is clear from all materials, temporary facilities, etc of the contractor and ACCEPTING AUTHORITY is satisfied with the job done by the Contractor.
- ii) The Contractor has submitted the reconciliation statement regarding the stores received from ACCEPTING AUTHORITY, and all the surplus and salvaged materials are returned to the stores.
- iii) All equipment, tools, plant taken from ACCEPTING AUTHORITY have been returned by the Contractor.
- iv) Any other material, taken on loan/transfer from other agency have been returned by the Contractor.
- v) All power and water supply connections taken for the execution of the works have been disconnected by the Contractor.
- vi) Rectification of any damage done by the Contractor to the work executed have been completed by the Contractor.
- vii) The works shall not be considered as completed until ENGINEER-IN-CHARGE/ ACCEPTING AUTHORITY has certified in writing that the works have been completed and the Defects Liability Period shall commence from the date of such certificate.

### 2.31.08 **TAKING OVER**

After completion of works or any substantial part of the works before the completion of the whole of the works, the Contractor shall notify ACCEPTING AUTHORITY in writing, who within 15 days of receipt of the said notice shall give such certificate with respect to any substantial part of the works which has been both completed to the satisfaction of ACCEPTING AUTHORITY and occupied or used by ACCEPTING AUTHORITY or refuse to issue the same stating the reasons thereof in writing. When any such certificate is given in respect of a part of the works, such part shall be considered as completed for the purpose of taking over and computation of the period of maintenance of such part, that is such period of the work as certified. The works in whole or part shall not however, be treated as completed for the purpose of other relevant clauses hereof unless and until the provision of this clause hereof are fully complied with.

### 2.31.09 **MAINTENANCE**

For a period of 36 MONTHS commencing immediately after taking over of the work by ACCEPTING AUTHORITY, the Contractors liability shall be to replace the defective parts, rectify/ reconstruct the defective work that may develop of his own construction or those of his sub-contractor approved by ACCEPTING AUTHORITY arising solely from faulty materials or workmanship.

If it is necessary for the Contractor to rectify/reconstruct any defective portions of the work under the contract, the provision of this condition shall apply to the portions of work so replaced or renewed until the expiration of three months from the date of such replacement or renewal or until the end of the above mentioned period of 36 months, whichever may be later. If any defects be not remedied within a reasonable time ACCEPTING AUTHORITY may proceed to do the work at Contractor's risk and expense, but without prejudice to any other rights which ACCEPTING AUTHORITY may have against the Contractor in respect of such defects.

The Contractor shall bear the cost of such repair/rectification carried out on his behalf at site. Immediately upon expiry of the maintenance period the ACCEPTING AUTHORITY shall issue a final certificate indicating that the Contractor has completed his obligation under the contract.

## **2.32 TERMINATION AND BACK CHARGING OF CONTRACT**

### **2.32.01 TERMINATION**

If the Contractor has abandoned the contract or has failed to proceed with the work due to negligence or the progress on any particular item, items is slow or has failed to execute the work in accordance with the terms and conditions of the contract, is persistently or frequently neglecting to carry out his obligation under the contract, then it shall be lawful for ACCEPTING AUTHORITY to terminate the contract forthwith under written notice and to proceed with the balance work through any other agencies. During the course of execution of the job, in case the Contractor has done any substandard work, he shall be asked in writing to dismantle and redo the same at his own expenses. If the Contractor fails to comply with the above instructions immediately, then ACCEPTING AUTHORITY shall proceed with the above rectification work, through another agency or agencies. Similarly, if the Contractor goes slow on any particulars item or items of work, ACCEPTING AUTHORITY shall have the right to execute this item or items through another agency or agencies, including its own department.

### **2.32.02 BACK CHARGING THE CONTRACTOR**

Extra cost and expenses incurred for completing the work of balance work or carrying out the rectification of any work as mentioned above through another agency or agencies including its own department, shall be debited to Contractor's account and shall be recovered from any money due or that may become due to the contractor without prejudice to any other remedy that may be available to ACCEPTING AUTHORITY in law. If there is any savings in cost due to re-arrangement or supplementing through other agencies the original contractor will not have any claim on this.

## **2.33 ALTERATIONS, ADDITIONS AND OMISSIONS**

### **2.33.01 VARIATION**

CONSULTANT with the approval of ACCEPTING AUTHORITY/OWNER shall be entitled to make any variation of the quality or quantity of the works or any part thereof that may in his opinion, is necessary and for that purpose, or if for any other reason it

shall, in his opinion be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:

- a) Increase or decrease the quantity of any work included in the contract.
- b) Omit any portion of work.
- c) Change the character or quality or kind of any such work.
- d) Change the levels, lines, position and dimensions of any part of the works and
- e) Execute additional work of any kind necessary for the completion of the works, and no such variation shall in any way vitiate or invalidate the contract by the value, if any, of all such variations shall be taken into account in ascertaining the amount of the contract price.

#### **2.33.02 ORDER FOR VARIATIONS TO BE IN WRITING**

No variation shall be made by the Contractor without an order in writing of Engineer-in-Charge, provided that no order in writing shall be required for increase or decrease in the quantity of any item or work where such increase or decrease is the result of the actual quantities exceeding or being less than those stated in the schedule of quantities which are estimates. In such cases, the Contractor shall be paid only for the actual quantity of work done as certified by Engineer-in-Charge at the accepted schedule of quantities and no compensation shall be allowed. Provided also that if for any reason Engineer-in-Charge shall consider it desirable to give any such order verbally, the Contractor shall comply with such order but it must be followed by confirmation in writing of such verbal order given by Engineer-in-Charge, which shall be deemed to be an order writing within the meaning of this clause.

#### **2.33.03 EXTRA ITEMS**

- .01 Any item of work that do not find a place in the schedule of quantities, in the original tender or in the accepted tender or contract as has been directed by Engineer-in-Charge to execute is deemed as an extra item of work. All such works that are necessary to be carried out under the direction of Engineer-in-Charge shall be carried out by the contractor. No such variation will violate the Contract.
- .02 Extra items of work thus carried out by the contractor will be paid at the rates worked out by Engineer-in-Charge in the following manner.
- .03 In the case of all extra items whether additional, altered or substituted, if accepted rates for identical items are provided for in the contract such rates shall be applicable.
- .04 In the case of extra items whether altered or substituted, for which similar items exists in the contract, the rates shall be derived from the original item by appropriate adjustment of cost of affected components. The percentage excess or deduction of the contract rate for the original item with reference to the estimated rate shall be applied in deriving the rates for such items.



- .05 In the case of extra items, whether altered or substituted, for which similar items do not exist in the contract, the rates shall be arrived at on the basis of provisions of standard data book and schedule of rates prevailing at the time of tender (as specified in general information of project in NIT) by adding profit and overhead charge of 15%.
- .06 In the case of extra items, whether additional altered or substituted, for which the rates cannot be derived from similar items in the contract, and only partly from similar items in the contract and only partly from the public work department rates, the rates for such part or parts of items as are not covered in the schedule of rates shall be determined by Engineer-in-Charge on the basis of the prevailing market rates giving due consideration to the analysis of the rate furnished by the contractor with supporting document including contractor's profit.
- .07 In the case of extra item whether additional, altered, substituted, for which the rates cannot be derived either from similar items of work in the contract or from the departmental schedule or rates, the contractor after execution of the work as mentioned herein above and shall within 14 days of the receipt of order to carry out the said extra item of work, communicate to the Engineer the rate which he proposes to claim for the item, supported by analysis of the rate claimed and Engineer-in-charge shall within one month thereafter, determines, the rate on the basis of the market rate giving due consideration to the rate claimed by the Contractor.

#### **2.33.04 REBATE/EXTRA OVER ORIGINAL ITEM**

If there is a deviation in the specification of particular item of the tender, rebate/extra over the quoted rate shall be generally derived as follows:

For items not covered in the schedule, rebate/extra shall be derived based on observation/ analysis of labour and materials involved in such items.

#### **2.33.05 ITEMS OF AD-HOC NATURE**

The Contractor shall procure necessary materials and carry out miscellaneous work of ad-hoc nature specifically provided with necessary tools and tackles as may arise during execution of the contract. The actual quantum of work shall be certified and settled by Engineer-in-Charge and payment for the same shall be fixed on the basis of actual cost plus overheads, profits and establishments taken at 15% of the cost.

#### **2.33.06 CLAIMS**

The contractor shall send to Engineer-in-Charge an account, giving full and detailed particulars with proper analysis of all claims for any additional expenses to which the Contractor may consider himself entitled to authorise payment to be made for any such work notwithstanding the Contractor's failure to comply with this condition if the Contractor has at the earliest practicable opportunity notified Engineer-in-charge in writing, that he intends to make a claim for such work.

## 2.34 MEASUREMENTS

### 2.34.01 QUANTITIES

The quantities set out in the schedule of quantities are the estimated quantities of the work. They are not to be taken as the actual and correct quantities of the works, to be executed by the Contractor in fulfillment of his obligations under the contract.

### 2.34.02 WORKS TO BE MEASURED

.01 Engineer-in-Charge shall, except as otherwise stated, ascertain and determine by measurement the value in terms of the contract. He shall when he requires any part or parts of the works to be measured, give notice to the Contractor's authorised agent or representative, who shall forthwith attend or send a qualified agent to assist Engineer-in-Charge or his representative in making such measurement, and shall furnish all particulars required by either of them. Should the Contractor not attend or neglect or omit to send such agents, then the measurement made by Engineer-in-charge and approved by him, shall be taken to be the correct measurement of the work. For the purpose of measuring such permanent work as is to be measured by record and drawings, Engineer-in-Charge shall prepare records and drawings month by month and the Contractor, as and when called upon to do so in writing, shall within fourteen days, attend to examine and agree such records and drawings with Engineer-in-Charge and shall sign the same when so agreed. If the Contractor does not so attend to examine and agree such records and drawings they shall be taken to be correct if, after examination of such records and drawings, the contractor does not agree to the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor shall, within fourteen days of such examination, lodge with Engineering in Charge for decision by ACCEPTING AUTHORITY, notice in writing of the respects in which such records and drawings are claimed by him to be incorrect.

.02 The contractor shall raise bills once a month or for a minimum payment of 10% of contract amount.

.03 The payment towards the MLCP item, 60% of payment will release after successful completion of the major components such as columns, beams and platforms. Next 25% of payment will release completion of all mechanical, electrical components and the final 15% will release after successful completion of installation, testing and commissioning.

.04 Payment towards all interim bills will be made by ACCEPTING AUTHORITY within 30 days of presentation by the contractor on availability of funds from Client and as per clause 3.12 in special conditions of contract.

.05 Period of final measurement shall be three months from the time of completion of the project.

### 2.34.03 METHOD OF MEASUREMENT

The works shall be measured in accordance to relevant IS codes notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the contract.

## 2.35 **PROVISIONAL SUMS**

- 2.35.01 "Provisional sum" means a sum included in the contract and so designated in the schedule of quantities for execution of works or the supply of goods, materials or services or for contingencies, which sum may be used, in whole, or in part or not at all, at the direction or discretion of Engineer-in-Charge. The contract price shall include only such amounts in respect of the work, supply or services to which provisional sums relate as Engineer-in-Charge shall approve or determine.
- 2.35.02 The contractor shall when required by Engineer-in-Charge, produce all quotations, invoices, vouchers and accounts or receipts in connection with expenditure in respect of provisional sums.

## 2.36 **FURTHER INSTRUCTIONS**

In this tender specifications of the works are given in the following sections:

### **A. TECHNICAL SPECIFICATIONS**

### **B. SCHEDULE OF QUANTITIES with Unit Rate Specifications**

Technical specifications are the general instructions for carrying out the works.

Unit rate specifications are the descriptions of items for which unit rates are to be worked out by the tenderer by considering all tender information.

The Contractor has to work out his rate as an overall percentage above or below or at the rate given in the Schedule by a single entry. The contractor's over all percentage shall be worked out based on the unit rate specification and rates provided against each specification.

The rate has to be entered by a single entry at the end of the schedule both in words and in figures.

Every contractor should furnish along with his tender income-tax clearance certificate and information regarding the income-tax circle or Ward of the District in which he is assessed by income-tax, the reference No. of assessment and the assessment year.

The rates should be quoted in decimal coinage system.

Certified copies of Registration Certificate, Partnership Deed and Power of Attorney or Articles of Agreement in case of Limited companies will have to be furnished for considering the acceptance of the tender.

Should the contractor notice any discrepancy or error in the statement made, or quantities or units shown against items, he shall immediately bring it to the notice of Engineer-in-Charge and obtain the clarification before submitting the tender. The tender shall be based on such clarifications received and shall be recorded as such in the covering letter to the contractor to execute the work according to the corrected statement made for quantities or units shown in the tender, without any compensation.

The tender of the Contractor not complying with the above instructions may be rejected. The tenderer should put the signature on all pages of the tender documents.

**2.37 MATERIALS OBTAINED FROM EXCAVATION**

The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc. as property of the OWNER and such materials shall be disposed off to the best advantage of the OWNER according to the instructions issued by the Engineer-in-Charge.

**2.38 TREASURE TROVE, FOSSILS, ETC.**

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the Site shall be the absolute property of the OWNER and the Contractor shall take reasonable precautions to prevent his workmen or any other person from removing or damaging any such article or thing. The Contractor shall immediately upon discovery thereof and before removal, acquaint the Engineer-in-Charge with such discovery and carry out the Engineer-in-Charge's directions as to the disposal of the same at the expense of the OWNER.

**2.39 JURISDICTION**

Any legal dispute arising out of or in any way connected with this contract shall be deemed to have arisen at site and shall be settled in a court of competent jurisdiction located in Ernakulam, Kerala.

**2.40 ADDITIONAL PERFORMANCE GUARANTEE**

If the rate quoted for individual item/items is unbalanced or unworkable the successful bidder shall provide additional performance guarantee for the unbalanced amount of the under quoted items and justification statement to be submitted for higher quoted beyond +125%. In view of the above, clarification on the estimate rates if any, can be availed from the office of CLIENT during office hours, one day prior to the bid submission.

SUPERINTENDING ENGINEER  
Kannur Municipal Corporation

I/We have carefully read the above said instructions and shall comply with the same.

Signature of the tenderer.

Place:

Date :

### 3.0 **SPECIAL CONDITIONS OF CONTRACT**

#### 3.1 **GENERAL**

The following special conditions shall be read in conjunction with general conditions of contract and amendments/corrections thereto. If there are provisions in this special condition which are at variance with the provisions in the above mentioned documents, the provisions in these special conditions shall take precedence.

The work in general shall be carried out as per the nomenclature of the individual items and in the particular specifications. For item of works, not covered above, the same shall be carried out as per standards.

For any other item of work, not covered in the above Paras, the same shall be done as per the latest relevant BIS codes of practice.

For any other item of work, not covered in the above Para, the same shall be done as per the sound engineering practice as directed/approved by Engineer in charge.

#### 3.2 **BRIEF DESCRIPTION ON THE ACTIVITES**

Design, Supply, Installation, Testing & Commissioning of Semi –Automatic Puzzle Parking Multi level Car Parking facility, Internal and External Electrical installations, Fire Alarm, Fire Fighting system with Sump & OHT, Solar System, Landscaping and allied works at STADIUM and BANK ROAD for Kannur Municipal Corporation under AMRUT scheme.

The contractor should obtain the NOC from Local Administrative department, fire Department and Electrical Inspectorate. The detailed design of foundation structures for the MLCP is prepared for the tender purpose only and the basic soil parameters and the load considered for the same is attached as Annexure A. The successful bidder should contest confirmatory soil test and should prepared the detailed design for the entire system and the same should be vetted by government approved agencies before the commencement of work.

#### 3.3 **MOBILISATION ADVANCE**

No mobilization will be paid to the Contractor

#### 3.4 **SECURED ADVANCE**

No secured advance will be paid to the Contractor

### 3.5 **BANK GUARANTEE**

Additional bank guarantee as performance guarantee from a scheduled bank has to be remitted by the Contractor who quote very low rates as below:

- i. If the quoted amount is 11 to 25% below the tender PAC, additional performance guarantee for the difference in PAC and quoted amount shall be submitted by the Contractor before executing the agreement and the same will be released after the satisfactory completion of work.

### 3.6 **CONSTRUCTION DETAILS**

Water required for the construction will have to be provided by the Contractors at their own cost. It will be the responsibility of the Contractor to make arrangements for drawing and bringing it

### 3.7 **WATER**

Water required for the construction will have to be provided by the Contractors at their own cost. It will be the responsibility of the Contractor to make arrangements for drawing and bringing it to the various construction points. Non availability of water from the owner's property will not be ground for any delay in work or any claim for any compensation whatsoever.

### 3.8 **ELECTRICITY**

Electricity required for the construction and general lighting of the site will have to be provided by the Contractors at their own cost. Non availability of power from KSEB will not be a ground for any delay in work or any claims for any compensation whatsoever.

Temporary wiring/cabbling shall not be routed across floors, around doors. It shall be properly routed as directed by the Engineer-in-Charge. Temporary wiring shall be protected from sharp edges, heat and sunlight to avoid breakdown of the insulation.

### 3.9 **DRAINAGE ARRANGEMENTS**

The contractor shall control the grading in the vicinity of the buildings and trenches, so that surface water is prevented from running into excavated areas. The contractor shall also be responsible to see that no area around his works becomes flooded during the rainy season because of his piled up material, etc. and subsequently floor another buildings. At the discretion of the Engineer-in-charge the contractor shall take steps to prevent flooding. It shall be the contractor's responsibility to keep areas around his work dry. The cost of repairing flood damage shall be the sole responsibility of the contractor.

### 3.10 **APPROACH ROAD**

The contractor will be required to construct suitable approach roads leading to the construction site from the main road Engineer-in-Charge and shall maintain it at his own cost.

### 3.11 **FABRICATION WORKS**

The contractor shall furnish to the Engineer-in-Charge 3 copies of detailed fabrication/erection drawing showing clearly all the joint details, two weeks before the commencement of actual fabrication/erection works. The Engineer-in-charge will have the right to suggest such modification to these details as found necessary by them, which shall be duly incorporated in the works by the Contractor. For the purpose of this clause, the two weeks period shall be deemed to begin from the date of the said drawings are received in the Engineer-in-charge office.

### 3.12 **GST AND ANY OTHER TAXES & DUTIES**

Unit rate shall be inclusive of all applicable taxes (Except GST) and duties and any other additional taxes.

Royalty charges & taxes if any on account of supply of materials for all works shall be paid by the Contractor at his own cost. No extra claim in this regard shall be admissible.

### 3.13. **TURNOVER TAXES/WORKS CONTRACT TAXES:**

Deductions will be made from the bills towards GST and any other laws. As per the existing provisions.

- a) Cess for the construction of works under building and other Construction Workers Welfare Cess Act-1996. The Contractor shall remit the building and other Construction Workers Welfare Cess at 1% on the total cost of construction including the cost of materials and shall produce the certificate of remittance of Cess to ACCEPTING AUTHORITY. In case the Contractor fails to remit the Cess the applicable Cess will be recovered from the final bill of the contractor.
- b) All plumbing and sanitary works shall be executed by a qualified and licensed plumber. The Contractor shall satisfy the Engineer-in-charge as to the competence and qualification of the workmen employed for plumbing and sanitary works.
- c) All shuttering used in the work shall be either steel shuttering or of plywood with smooth surfaces so as to give a smooth finish to the concrete.
- d) All fixtures & fittings (plumbing fixtures, sanitary materials, doors & window fixtures etc.) have to be got approved by the Engineer-in-charge in writing before fixing the same. However samples of all these fixtures & fittings have to be got approved well in advance of bulk procurement action.

### 3.14. **PROCUREMENT OF MATERIALS**

Contractor shall make his own arrangements for the procurement of all materials required for the work including cement, steel etc. No assistance will be provided by ACCEPTING AUTHORITY for arrangement for quarries for sand, metal or earth.

#### 3.14.1 **CEMENT**

The cement to be used shall be ordinary portland cement conforming to IS: 8112-1989 for 43/53 Grade OPC/PPC unless otherwise mentioned. The cement should be procured from reputed manufacturers and as approved by the Engineer-in-Charge. Whenever possible, all the cement shall be obtained from one constant source throughout the contract. Cement of different types shall not be mixed one with the other. Different brands of cements or same brand of cement from different sources shall be not used without prior approval of the Engineer-in-Charge.

The cement shall be delivered at site in original sealed bags which shall be labeled with the weight, date of manufacture, brand and type. Cement received in torn or hand-stitched bags shall not be used. For volumetric batching of concrete, cement should be mixed only by box measurement. All cement should be fresh when delivered and shall be stored in an approved manner in stores built by the Contractor at his own cost. Set cement shall not be allowed to be used for any work.

With each and every delivery of cement, the Contractor shall provide a certificate that the cement conforms to the relevant Indian standards. Seven days test, to determine the strength of cement, of each batch shall be done immediately upon arrival of the said material and the cement shall be used only after the test result is approved by the Engineer-in-Charge. The cost of the above tests shall be borne by the Contractor.

#### 3.14.2 **QUALITY CONTROL ON CEMENT CONSUMPTION**

After the completion or at the stage of the determination of the contract, the theoretical quantity of cement shall be computed on the basis of statement showing quantity of cement to be used in different items of work as provided in Data Book. In case any item is executed for which standard co-efficient for the consumption of cement is not available in the above mentioned statement or cannot be derived from the statement, the same shall be calculated on the basis of formula to be laid down by the Engineer-in-Charge.

Over this theoretical quantity of cement required a variation upto (-) 2% may be allowed for less consumption of cement at the discretion of the Engineer-in-Charge provided Engineer-in-Charge is otherwise satisfied with the quality of the works executed. Such variation if more than (-) 2% will attract action of levy of compensation at the rate of twice the prevailing market rate of cement of the quantities consumed less over permissible (-) 2% variation provided Engineer-in-Charge decides to accept the work depending upon its quality etc.



### 3.14.3 CONSUMPTION OF CEMENT

Quantity of cement will be decided based on the DESIGN MIX. For concreting under water, 10% extra quantity will be allowed.

The contractor should submit design for the same before starting the work and after getting the trial mix approved by the Engineer, follow the same for execution of work.

Only the approved design mix shall be used for the concrete. The following minimum quantity of cement should be used of various grades of concrete:

M20	: 320 Kgs/Cum	} With 43 /53 grade OPC/PPC
M25	: 330 Kgs/Cum	
M30	: 340 Kgs/Cum	
M35	: 350 Kgs/Cum	
M40	: 360 Kgs/Cum	

Note: While doing mix design, design mix should be prepared with atleast 3 brands of cement from approved list to overcome situations of non-availability of a particular brand of cement.

### 3.14.4 CONCRETE PLANT

Modern dependable batch type mixing plants capable of producing concrete at the desired output to meet the scheduled requirements shall be provided at locations and in the manner approved by the Engineer.

### 3.14.5 STEEL

Steel reinforcing bars shall be round bars of grade I quality conforming to IS: 432 or High Yield Strength Deformed Round Bars conforming to IS:1786 and have to be purchased from approved manufacturer approved by ACCEPTING AUTHORITY. The Contractor shall place direct order on the manufacturing company without involving dealer or distributor.

With each and every delivery of consignment of steel the contractor shall provide the certificate that the steel conforms to the relevant Indian Standard. Any test required to be carried out on steel at all stages of construction shall deemed to be included in Contractor's scope of work. Type of test, frequency of test, acceptance criteria etc. for steel will be as per specification.

Conversion of length of various sizes of MS bars and for Tor Steel bars into weight are as under:-

Size (Dia) mm	Weight : Kg/M	Size (Dia) mm	Weight : Kg/M
6	0.222	25	3.855
8	0.395	28	4.836
10	0.617	32	6.316
12	0.888	36	7.994

16	1.579	40	9.869
18	1.999	45	12.490
20	2.467	50	15.424
22	2.985		

The actual quantity of steel shall be taken for measurement purpose as the quantity fixed as per approved design/drawings or as authorised by ACCEPTING AUTHORITY including authorised lap length/chairs etc. as per the standard sectional weights given in the above table or the actual weight whichever is less. Actual sectional weight of the steel if weighs less than 2% of the standard weights shown above shall be rejected. Nothing will be paid extra for wastage and rolling margin.

In the case of structural steel sectional the theoretical weight shall be calculated from the steel tables or actual weight whichever is less.

The average sectional weight for each diameter shall be arrived at from samples from each lot of steel received at site. The actual steel consumed shall be worked out by this procedure. The discretion of the Engineer-in-Charge shall be final for the procedure to be followed for determining the average sectional weight of each lot. Quantity of each diameter of steel received at site at work each day will constitute one single lot for this purpose.

**Ready-mix Concrete:**

Ready-mixed concrete supplied by ready-mixed concrete plant shall be preferred. For large and medium project sites the concrete shall be sourced from ready-mixed concrete plants or from on site or off site batching and mixing plants (see IS 4926).

If ready-mix concrete is used, it is mandatory to use the ready-mix concrete from RMC plant which is registered under Quality Council of India.

### 3.14.6 **SITE OFFICE**

A site office of size 4mx3m to be provided by the Contractor for the use of Client. The Office should have with required furniture toilet facility, water and power.

The following minimum furniture / equipments shall be provided.

- a. Executive tables - 2 Nos
- b. Chairs - 6 Nos
- c. Steel Almirah - 2 Nos
- d. Ceiling/Wall/Pedestal fan - 2 Nos
- e. Fluorescent light fixtures - 2 Nos
- f. Power socket for laptop - 2 Nos

The Contractor has to dismantle and remove the temporary office after the completion of the Project.

### 3.14.7 **SUPERVISORY STAFF**

The Contractor shall appoint required number of experienced and qualified technical and supervisory staff at the site for supervising the work and shall see that all of them are always at the work spot during the working hours, personally checking all items of work. He shall take such orders as may be given to him by the Engineer-in-charge from time to time and shall be responsible to carry them out properly. In case Contractor fails to provide sufficient person as per terms given below, Owner/Client reserves the right to deduct a reasonable amount from the Contractor's bill, subject to a maximum of Rs.25,000/- for every month of absence.

### 3.14.8 **PROGRAMME OF WORKS AND PROGRESS REPORTS**

- a) The entire work is scheduled to be completed as stipulated in NIT. The Contractor shall programme the different items of work in accordance with the detailed time schedule approved by the Engineer-in-charge.
- b) **CONTRACTOR TO SUBMIT PROGRAMME**  
After the acceptance of his Tender, the Contractor shall, within fifteen days, submit to the Engineer-in-Charge for his approval, a detailed programme taking into account the total time period stipulated in the contract showing the order, the procedure and method in which he proposes to carry out the works.

He shall furnish the particulars in writing of his arrangements of manpower, plant and machinery, shuttering and all other resources owned and dedicated to this work. Cash flow during the execution of project for procurement of materials and for

carrying out of the works including temporary works which the Contractor intends to construct shall also be furnished.

In support of this programme, the Contractor shall submit a work schedule in the form of a CPM/PERT Chart. The Engineer-in-Charge shall if necessary modify the programme submitted by the Contractor and approval shall be given by the Engineer-in-Charge indicating the major milestones. The programme approved by the Engineer-in-Charge shall be final and binding on the Contractor. The approval by the Engineer-in-Charge of such programme, or furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the contract.

During the progress of work, the Contractor shall be required to furnish the resource mobilisation plan as required by Engineer-in-Charge to keep up the target date of completion.

This CPM/PERT programme will be required to be updated every three months or more frequently as directed by the Engineer-in-Charge, based on the actual progress, resource mobilisation and other field conditions actually prevailing.

c) **PROGRESS REPORTS AND SCHEDULES**

The Contractor shall submit to the Engineer-in-Charge by the third day of every fortnight, six (6) copies of a report in a duly approved format showing the progress made in construction of the works mobilisation of resources etc. during the previous fortnight.

d) The Contractor shall also submit by the end of every month his anticipated progress schedule for all items of work for the following month in six (6) copies in an approved proforma to the Engineer-in-Charge.

e) The Contractor shall also submit Photographs of completed works along with Monthly Progress Report (both soft copy & hard copy of approved size)

**3.15 RELEASE OF PAYMENTS TO THE CONTRACTOR**

It is specifically and distinctly understood that the 'Consultants' acts purely as agents of the principal, namely the 'Owner' and the ownership in the property in the goods 'as goods or in some other form' is transferred directly from the 'Contractor' to the 'Owner'.

The 'Consultant' shall pay all amounts due to the 'Contractor' as per the terms of payment mentioned in the tender document on receipt of the funds from the 'CLIENT/OWNER'. The consultant has no independent liability for obligation to settle payments to the contractor as the scope of consultancy is limited to planning, execution and supervision of the project and the consultant is only acting on behalf of the 'CLIENT/OWNER'.

### 3.16 **ROOFING**

The Contractor or his accredited representative shall be present at site while fixing the structure / truss. The Contractor shall survey the structure, checking line, level and fixing points before commencement and report immediately to the Engineer-in-charge if the structure is unsuitable to receive the Aluminium Self-Supported Profile/ Flashings. Contractor shall co-ordinate with the structure/civil contractor and take necessary action to guarantee the water tightness of the roofing sheet including the cost of all accessories like hats, brackets etc. complete as per the approval of Engineer in charge, without any additional payment. If the line and level of the steel structure is not within the tolerance of 10mm, hats /brackets shall be provided and the rate for the roofing shall include the cost of GI brackets/hats etc. Nothing extra will be paid for this.

### 3.17 **CLEARING SITE**

Contractor should supplying manpower & machinery for cleaning and clearing the debris at all levels and disposing complete as directed by Engineer-in-Charge.

### 3.18 **DOCUMENTATION**

The Contractor shall prepare and submit the detailed documentation of all the structures by means of Photography (hard copy and soft copy), Video by a professional photographer covering various views of the project up to the satisfaction of the Consultant/ Client and all as built drawings along with the final bill.

3.19 Prior written approvals shall be obtained from the Accepting Authority/Consultant for executing the work using the equivalent make brand, which was not specified in the tender. The equivalent make shall be approved only if the specified brands are not available in the market and upon submission of documentary evidence for the non-availability of the same. "

**SUPERINTENDING ENGINEER**  
Kannur Municipal Corporation

**INFORMATION ABOUT THE TENDERER**  
**(To be filled by the tenderer)**

1	Name of Bidder		
2	Registered office with address for communication	Full postal address	
		Telephone No	
		Mobile No.	
		Fax.No.	
		Email Id	
3	Status of the bidder (individual / Partnership/Private Company/Public Limited Company)		
4.	Details of local office	Address	
		Contact Peron	
		Tele.No.	
		Mobile No.	
		Fax No.	
		Email Id	
5	Particulars of experience as Prime Contractor as per eligibility criteria mentioned in NIT		
6	Annual turnover for the last three years	2014-15	
		2015-16	
		2016-17	
7	Permanent Account Number (PAN)		
8	GST Rate		
9	GST Reg No.		
10	PF Reg.No		
11	ESI Reg No.		

**(Attested copies to prove the above shall be submitted along with the tender document)**

Signature & Seal of tenderer:

Date:

Name of Tenderer:

Address:

## **5.0 TECHNICAL SPECIFICATION MLCP**

### **5.1 SCOPE OF SUPPLY**

The specifications cover the Design, Manufacture Supply, Installation, Testing and Commissioning of Multi level car parking system using puzzle parking technology with parking management system.

### **5.2 CODES AND STANDARDS**

All the equipment supply, installation & commissioning shall comply with the latest edition of the relevant Codes & standards.

### **5.3 TECHNICAL REQUIREMENTS**

The MLCP system proposed at Putharikandam consists of Puzzle parking system with 4 units of Six Level Six Grid (Type-1) and 2 units of Six Level Eight Grid ((Type-2) over-ground Puzzle Parking System with Electro Mechanical technology to accommodate minimum of 31 Cars Per Type -1 unit and 43 Cars per type-2 unit and in total minimum 210 car spaces

### **5.4 CONSTRUCTIONAL FEATURES**

The proposed Parking system shall be semi-automatic puzzle parking. All empty pallets shall automatically move itself, after a predetermined time to the loading level and the driver shall drive into the empty pallet, position the car and leave. The system automatically shifts the car to an empty location and another empty pallet (if any) shall replace the loaded pallet.

The pallets/ platform shall be of steel construction, 1.6 Mm Thick Galvanised Corrugated Anti Skid Type With Wheel Stopper (Anti Rolling) & supporting members by angle or channel. All Exposed Steel Structural Members and Sheet Metal to Be Powder coated with 80-90microns.

All pallets shall be numbered. The numbering should be bright and large for anyone to read. The same numbering shall be provided on the control panel. To retrieve the car, the driver has to press the required pallet number on the control panel. The called pallet is moved to the loading level. The driver enters the car and drives away.

The parking system shall have a combination of vertical and lateral movement of pallets (platform) to accommodate maximum number of cars within the available space. Limit

switches, sensors and interlock safety systems shall be provided for accurate and safe movement of the pallets.

Light ray sensors shall be provided to detect human presence and vehicle movement on the pallet. The system shall ensure that the pallet does not move in case it detects human presence and/or vehicle movement on the pallet. Any attempt to move the pallet under above circumstances shall sound an alarm and prevent the movement.

An emergency STOP button shall be provided in the control panel and at all access levels to stop the system during any emergency. Upon activation of the Stop button, the system shall be electrically cut off.

The whole sequence of operation shall be computer controlled through Microprocessor based programmable Logic circuit. The control panel shall be conveniently located at the loading/unloading level. The Control panel shall be IP 54 rated.

All wiring shall be neatly laid through troughs and conduits. Wires shall enter through proper glands. Motors, Control panels and metal components shall be earthed as per local code requirement. There shall be no loose wires. All wires shall be properly tagged.

Each module shall be provided with Green and Red lights to indicate availability/non availability of vacant parking slot in the module.

Indicators shall be placed on the wall opposite the entry direction at the loading level, to guide the driver to position the car properly within the pallet. There shall be four position indicators which shall all glow green if the position is perfect. This shall enable the driver to check if he has positioned the car properly before leaving.

The empty slot (void) shall never position itself in the loading level. A pallet empty or loaded shall only be available at the loading level.

**5.5 TECHNICAL SPECIFICATIONS**

No	Part Name	Contents	
<b>1</b>	Minimum dimension and weight of a CAR (general category) to be considered	Length	5.05 m
		Width	2.15 m
		Height	1.8 m
		Weight	1800 kg
<b>2</b>	Minimum dimension and weight of a CAR (SUV category) to be	Length	5.20 m
		Width	2.2 m



No	Part Name	Contents	
	considered. (To be provided at bottom and top most level of the puzzle parking system in all module(s))	Height	2.2 m
		Weight	2500 kg
3	Choice of technology	Puzzle Parking (Semi Automatic)	
4	Material of Construction of Parking facility	Steel conforming to IS 2062 and designed as per IS 800:2007. Full structure should be powder coated. Pallet to be covered with Galvanized sheet to protect against corrosion.	
5	Horizontal driving motor	Power	Minimum 0.5HP per platform
		Drive	Gear motor with brake
		Speed	Min 4.2 m/min
6	Vertical driving motor	Power	Can be carrying based on height.
		Drive	Gear motor with brake
		Speed	Min 6-8 m/min
7	Operation	SEMI AUTOMATIC/ MANUAL	
8	Platform Profile	1.6 mm Thick Galvanised Corrugated Anti Skid Type With Wheel Stopper (Anti Rolling) & supporting members by angle or channel	
9	Protection	All Exposed Steel Structural Members And Sheet Metal To Be Powder coated with 80-90microns. The choice of colours should be approved by the Architects	
10	Platform Drain Arrangement	A drain arrangement provided to prevent water stagnation and oil dripping	
11	Mechanical Safety	Prevents accidental lowering of platform	
12	Lifting Speed	0.1 M/S	
13	Horizontal Sliding Speed	0.125 M/S	
14	Control	Microprocessor based programmable and logic controls	
15	Operating Key Pad	ALPHA NEUMERIC	
16	Power Supply	415V , 3PH, 50 HZ	
17	Safeties	A) Chain Monitoring System B) Locking Levers For Lower And Upper	

No	Part Name	Contents
		Platform C) Limit Switches D)An Emergency Stop Push Button In The operating panel E)Mechanical Safety That Prevents Accidental Lowering Of Platform F) Over run protection system
18	Movement Sensors	Light ray sensors to detect human and vehicle movement
19	Lifting Device	Electrically operated system, Sprocket Wheels, Chains & Limit Switches as applicable.
20	Suspension	Suspended at four points & guided along the supports using sliding bearing
21	Horizontal Drive	Horizontal movement of platform with AC geared motors having low noise & guide rollers
22	Control Panel	Operating panel conveniently located for selecting required parking space
23	Electrical Protection Standard	MINIMUM REQUIREMENT IS IP54
24	Synchronization	3/4", Simplex Chain & Sprocket On Both Sides Of The Column
25	Average Retrieval Time	Not more than 90 seconds
26	Automatic Vehicle Retrieval.	The control system shall have buttons corresponding to each pallet upon activation of which the particular pallet shall move to the unloading level.
27	Manual Cranking Device	Manual cranking device to lower, rise or move the pallet to retrieve the vehicle in case of power failure
28	Position Guiding Sensor	Sensors along with red and green lights shall guide the vehicle into the pallet. This has to be provided at the loading level
29	Empty Pallet	After a pre determined time an empty pallet should always position itself at the loading level
30	Warranty	12 months after completion of installation.
31	O & M	9 year after Warranty on AMC

## 5.6 LIST OF MANUFACTURES

No	Part Name	Contents
1	Steel structures	JSPL/TATA /Mahamaya/Mtl
2	Wire rope	BWR/Usha martin
3	Control System	Allen Bradley PLC with TSD/ Equivalent
4	Display	Allen Bradley/ Equivalent
5	Cables	Lapp/Finolex/RR Kabel/ Equivalent
6	Sensors/ Limit switches	Omron /Sick/Honeywell/Avon
7	Geared Motors	Bonfiglioli/Remi/Premium/LHP/LEDL/ HEM/IC Bauer /SEW
8	Motor Break	OEG/Emco/Uniforge/ Equivalent
9	Platform Floor	GI Profiles- Jindal/Tata/Uttam Galva/POSCO
10	Control Panel	Main PLC – Allen Bradley/ Equivalent Operator Interface – Allen Bradley Touch Screen/ Equivalent Electricals – Siemens/Hager/AB/L&T/ LS, Schneider, Omron
11	Display	LED Display for Parking Guidance
12	Painting	Epoxy Painting, Powder Coating

## **6.0 TECHNICAL SPECIFICATIONS (ELECTRICAL WORKS)**

The tender specifications consists of 17 sub heads as shown below:

1. General.
2. Diesel Generator set & Ancillaries
3. LT Panels boards
4. Cables & Cabling
5. Wiring & Accessories
6. MCB and MCB distribution Boards.
7. Light Fixtures and Fans
8. Earthing & Lightning Protection
9. Cable tray
10. Installation
11. Measurement
12. Abbreviations

### **1.0 General**

The bidder should note that the specifications furnished in the tender is of general nature only and it is the responsibility of the bidder to supply, install and commission the equipment and services required for the satisfactory performance of the installation. All the items of equipment required for the safe and satisfactory operation of the installation shall be supplied and installed by the bidder.

The intent of this specification is to define the requirements for the design, manufacture, shop testing, supply, installation, testing and commissioning of the electrical system like, Diesel generator sets, LT panel boards, Power & control cables, wiring, lighting, earthing network etc. Requirement shall be as specified in schedule of requirements/approved drawing of the Purchaser or as per the battery limits fixed by the Client/Consultant. The bidder shall furnish complete details of the equipment with all necessary drawings.

### **2.0 DIESEL GENERATING SETS & ANCILLARIES**

#### **Scope**

The scope of these specifications covers the supply, installation, testing and commissioning of 415V, 3ph, 4 wire DG sets as specified and given in Bill of Quantity and sigle line diagram. The synchronous speed of the set shall not be more than 1500 RPM.

DG Set shall be with acoustic enclosure and shall have a common bed plate mounted and complete in all respect including the ancillary equipment such as batteries, auxiliary lube oil pumps, filters, exhaust piping stack with proper supports as per polution control board norms, oil storage tank etc. including piping required for interconnection between the set and the diesel tank which are mounted separately. The set shall be mounted in a sound proof enclosure.

Rating of the diesel alternator shall be based on the operation of the set when equipped with all necessary operating accessories. The complete set shall be capable of producing specified output continuously at the climatic conditions mentioned below.

Climatic condition

Ambient temperature 10 to +40°C

Altitude upto 500 M above mean sea level

Design of the equipment should take these conditions into account. The equipment shall be given tropical and anticorrosion treatment.

### **Acoustic Enclosure**

Suitable acoustic enclosure shall be provided for each DG set to limit the noise to 75dB at 1meter from the enclosure. This enclosure shall conform to the pollution control norms of the Pollution Control Board/any other statutory authority and Environment Pollution Act with its latest amendments

### **Diesel Engine**

a) Construction

Engine shall be of robust construction suitable for prime rated operation. Bearing housings shall be sealed against ingress of dirt and loss of lubrication. The diesel engine shall be four stroke, multi-cylinder type but not less than four cylinders. The engine rating shall be higher than alternator.

b) Material

The selection of suitable material shall be the responsibility of the contractor in accordance with accepted practices. Full details of the material of construction for major components shall be included in the offer.

c) Dynamic characteristics

An analysis be made of engine, couplings and driver/driven unit to ensure that complete installation starts, operates and stops free of vibrations and oscillations as per normal industrial standards. The Contractor shall provide calculations, etc. as evidence to support that such as analysis has been made.

d) Filters

The following filters shall be used :

- i) Air - Paper type air filters for direct mounting on the engine air manifold or as specified by the engine manufacturer.
- ii) Fuel - Duplex fuel oil filters or as specified by the engine manufacturer.

iii) Lubricating oil - Simplex lube oil filters or as specified by the engine manufacturer.

e) Flywheel

Flywheels shall be designed and manufactured to meet cyclic variation levels.

f) Priming pump

Contractor should provide pump for priming the engine bearings and for emptying sump.

g) Governor

Governor should be Electronic type. Governor should maintain the speed within 1/8 cycles minimum, of 50 cycles from no load to full load generator output. The frequency at any constant load, including no-load, shall remain within a steady state band width of rated frequency. The governor shall not permit frequency modulation to exceed one cycle per second.

h) Fuel System

Fuel system shall have gravity feed to engine driven fuel pump and a replaceable element fuel filter conveniently located for servicing. Contractor shall provide fuel oil tank of specified capacity with supports, guage and connecting piping upto fuel oil pump suction header. The fuel tank should be of floor mounted type fabricated out of 3mm thick MS sheet steel painted and with standard accessories like fuel level indicator, fuel inlet and outlet air vent, drain plug inlet arrangement for direct filling and set of braided fuel hoses.

i) Lubricating oil

All lubricating points of the engine shall be connected to pressure oil system. The system shall be so designed that when the engine starts after prolonged shutdown, lubrication failure does not occur. Oil drippings from lubricating points shall have connections to the oil sump and get recirculated. Full flow strainer shall be fitted with level gauges for visual observation. Contractor shall provide motor driven lube oil pump if required to keep the bearings primed. Its power consumption to be indicated. The frequency and duration of the pump operation to be specified.

j) Starting System

Engine shall be started by 24V D.C. starting motor engaging on the toothed ring of the flywheel.

k) Ladders and Platforms

Necessary platforms and railings shall be provided by the contractor around the engine if required.

l) Installation and Silencer

The foundation drawing of the D.G. Set shall be provided by the Contractor, and it is the responsibility of the contractor to provide the Accepting Authority with all drawings, design calculations, etc. well in advance as per the manufacturer's specifications and meeting statutory standards and requirements. Contractor shall provide skid mounting with common base plate and all mounting structure, shims, etc., for the diesel alternator set. Contractor has to mount the engine with alternator on the base plate and align and assemble the set. Suitable anti-vibration mountings as approved for the complete set shall be provided. Coupling (both halves) with guards shall be provided. Contractor shall provide insulated exhaust piping with Aluminium cladding for each set and there should be hood on top of the exhaust pipe and the work should be as per electrical inspectorate rules and pollution Control specification. The stack and stack foundation shall be provide as pollution Control specification.

**Exhaust stack height:**

In order to dispose exhaust above building height, minimum exhaust stack height should be as follows:-

**(a) For DG set up to 1000KVA :-**

$$H = h + 0.2 \times \text{Sq.rt of } (KVA)$$

Where H = height of exhaust stack

h = height of building

**(b) For DG set above 1000KVA :-**

30m High or 3m above the building height, which ever is higher.

m) Insulation of the exhaust pipe shall be carried out as follows

- i) Surface shall be thoroughly cleaned with wire brush and rendered free from all foreign matter and grease.
- ii) 75 mm thick insulation fixed tightly to the surfaces butting all joints and tightened with lacing wire. (Type of insulation to be got approved by the Engineer-in-charge).
- iii) Insulation to be wrapped with aluminium sheet 26 guage and joints overlapped and sealed with adhesive tape and in addition fixed with cadmium coated steel screws.

n) Instrumentation & Controls

Instrumentation shall be housed in the control panel of the DG set.

Following instruments shall be provided :

- i) Cooling water/ coolant temp. indicator (deg.C)

- ii) Lubricating oil temperature indicator (degree C))
- iii) Lubricating oil pressure low (psig).
- iv) Tachometer
- v) Engine run hour and RPM meter
- vi) Engine over speed and under speed indicator
- vii) Cooling water/ coolant temperature high (alarm & light)
- viii) Low lube oil pressure (alarm & light)
- ix) Engine start – stop control switch with keys
- x) Battery voltage indicator

Multifunction Electronic/ digital meters indicating the above parameters shall also be acceptable.

o) Controls

Following protective devices and equipment shall be provided for the engine protection

- i) Electronic overspeed governor and shutdown device, visual and audible alarms and associated devices shall be provided to stop the engine in the event of any of these faults.
  - a) Low lubricating oil pressure.
  - b) Excessive cooling water/ coolant temperature.
  - c) Overspeed and under speed (alarm & trip)
  - d) High Vibration (alarm & trip (Max: 7mm/s)
  - e) High bearing temperature (alarm & trip (Max: 95 degree C)
  - f) Exhaust gas temperature high (alarm & trip (Max: 500 degree C)
  - g) Charge air temperature high (alarm & trip (Max: 70 degree C)
  - h) Jacket water temperature high (alarm & trip (Max: 95 degree C)
  - i) Lubricating oil temperature indicator (alarm & trip (Max 65 degree C)
  - j) Lubricating oil pressure low (alarm & trip (Min: 2.5 bar)

**Alternator**

- a) Standards

Alternator shall be in accordance with the relevant Bureau of Indian Standards prevailing on date (IS 4722) with upto date ammendements.



b) Type

The machine will be of rotating field stationery armature type, brushless, self-excited, and self regulated air cooled with IP classification 23. The excitation supply shall be obtained from a shaft mounted exciter, an A.C. generator, supplying the field winding through shaft mounted rectifier from the alternator terminals.

c) Technical data for the Alternator shall be as indicated below:-

- Rated KVA (at site conditions) - as per BOQ
- Power factor - 0.8 (LAG)
- Duty - prime duty
- Rated rpm - 1500
- Voltage - 415V
- Number of poles - 4
- Rated Frequency - 50 Hz
- Over speed - 20 % for 2 minutes
- Over load - NA
- Insulation class - H
- Enclosure - IP 23
- No. Of bearings - 1
- Excitation - Brush less.
- Type of AVR - Static
- Connection - Star
- Termination box - IP 55

d) Performance

The voltage regulation from no load to rated full load shall be within a band +1 to -1% of rated voltage. Steady state voltage modulation shall not exceed one cycle per second. For any addition of load upto and including 90% of rated load, the voltage dip shall not exceed 10% of rated voltage. The voltage shall recover to and remain in the steady band in not more than 1.5 seconds.

The frequency regulation from no load to rated load shall be in accordance with that defined by the engine governor performance. For any addition of load upto 90% of rated load, the frequency shall recover to the steady state frequency band within 5 seconds.

e) Enclosure

Alternator stator enclosure shall preferably be totally enclosed fan cooled (IP 21). However, if this is not feasible, a screen protected drip proof (SPDP) enclosure may be accepted, provided special treatment is given to winding, such as double impregnation of windings. The stator frame shall be either of cast iron or of fabricated steel construction.

f) Terminal Boxes

The main terminal box for alternator output terminals shall be suited for termination and connection of aluminium conductor armoured cable. A control terminal box shall be provided on the base frame. All wirings from electrical/ instrumentation equipment or devices on the engine alternator shall be brought upto this terminal box from where external wiring to other equipment shall be carried out. The terminal box of DG set should be suitable for termination of sufficient runs of 1.1kV grade XLPE cables.

g) Earth Terminals

Two number 12 mm dia earth terminals to be provided on opposite sides of the alternator, complete with all hardware, including plain and spring washer for secure, vibration-proof connections; all hardware to be galvanised or plated and passivated.

h) Voltage Regulations

Contractor shall submit in his quotation the momentary voltage dips and period required for voltage to recover its normal value corresponding to loading performance of the set.

i) Winding

The alternator winding shall be of Copper and render them non-hygroscopic and resistant to acidic/alkaline vapours. Class 'H' insulation shall be used for stator and rotor winding.

j) Space Heaters

Anti-condensation space heaters shall be provided to maintain winding temperature 5 Deg. above ambient temperature. The heaters shall be suitable for operation on 240 V, 1 Phase, 50 Hz., A.C. Supply, Heater terminals shall be brought out to a separate terminal box. A caution name plate 'Caution Live Terminals - Isolate Supply Elsewhere Before Disconnecting' shall be affixed on the terminal box. The space heaters shall be of metal encased and low surface temperature type.

- k) Base Frame  
Engine and Alternator shall be coupled and mounted on a sturdy, fabricated, welded construction; channel iron base frame with coupling guard and antivibration pads.

#### Inspection & Testing

The DG set shall be subjected to all Routine Tests including operation test for demonstrating full load and over load performance as per relevant IEC/ State Electrical Inspectorate standards.

#### Lead Acid 24 V D.C. Battery

- a) General

The battery cells and charging equipment will be housed in separate units. The battery shall be of sealed maintenance free (SMF) Lead acid type in accordance with IS 1652 'Specifications for Stationary cells and batteries lead acid type'.

- b) Construction

Batteries shall be of lead acid, sealed maintenance free type, indoor, The battery shall be sealed and complete with intercell connectors, acid level indicating floats, filter vent plugs, etc. The Batteries should be mounted on suitable metal stand having undergone anticorrosive coating.

- c) Capacity

The battery Ampere hour rating shall suit the required duty. The discharge rate shall take into account the maximum load imposed during starting of engine, together with steady load as indicating lamps, relays, etc. Battery capacity shall be suitable for meeting the needs of starting system (as three attempt starting), as well as the requirements of control panel, indications and auxiliaries such as priming pump as applicable etc. The scope shall cover all cabling, terminals, including initial charging etc. The system shall be capable of starting the DG set within 20-30 sec., even in winter condition with an ambient temperature down to 00C.

Any accessories and tools required for battery and shall be supplied by the Contractor if required:

#### **Battery Charger**

- a) General

The battery charging equipment (transformer rectifier unit) are provided to charge the 24 V battery required for Diesel Engine starting. **A separate (additional) battery**

**charger suitable for charging the battery using external 230V AC supply is also supplied along with each DG set.**

b) Operation

- (i) The battery will normally be in parallel with a constant voltage float (trickle) charger of adequate capacity to meet the continuous loads and to keep battery in fully charged capacity under all the conditions of system variations.
- (ii) A separate boost charge shall be provided for initial charging and re-charging the batteries when they are in 'run-down' condition. a selector switch for selecting 'float charge', 'boost-charge' shall also be provided on panel.
- (iii) Protection against overcharging of batteries should be provided in the Battery charger

c) Accessories

The following instruments shall be mounted on the charging panel:

- i) Voltmeter with protective HRC fuses
- ii) Ammeter

Contactors, Relays, Auxiliary Relays, Timers etc

Control Panel shall be equipped with contactors, relays, auxiliary relays and timers etc.

Manual operation of the Generating Set

The Control Panel, though catering to the auto-start and other functions described above, shall facilitate, whenever necessary, manual start, stop and test run of the generating set.

Visual Indicators on the Control Panel

The following flush mounted visual indicator lamps shall be provided on the front panel of Control Panel

- (i) Status of Mains supply, R, Y, B indicators.
- (ii) Status of alternator supply R, Y, B indicators.
- (iii) Load ON mains indicator.
- (iv) Load ON alternator indicator.
- (v) Mal function indicators
  - a) Set fails to start.

- b) Overload.
  - c) Low lubricating oil pressure.
  - d) High coolant/water temperature.
- (vi) Battery supply healthy.

#### Service Accessibility

Genset / Engine control panel should be visible from outside the enclosure.

Routine/periodical check on engine / alternator (filter replacement and tappet setting etc.)

For major repairs / overhaul, it may be required to dismantle the acoustic enclosure.

Sufficient space should be available around the Genset for inspection and service.

#### General Design Guidelines

To avoid re-circulation of hot air, durable sealing between radiator and canopy is must.

Temperature rise inside the room should not be more than 5°C for maximum ambient above 40°C and it should be below 10°C for ambient below 40°C.

There should be provision for oil, coolant drain and fill. Fuel tank should have provision for cleaning.

The room should be designed to meet the total air requirement for the D.G. Set at full load at site conditions as recommended by the engine manufacturer.

#### Drawings for approval on award of the work

The contractor shall prepare & submit three sets of following drawings and get them approved from the Engineer-in-charge before the start of the work. The approval of drawings however does not absolve the contractor not to supply the equipments/materials as per agreement, if there is any contradiction between the approved drawings and agreement.

- (a) Lay out drawings of the equipments to be installed including control cables, fuel/ lube oil pipes and supports/ structure for exhaust piping, Chimney and bus ducts/ cable trays.
- (b) Drawings including section, showing the details of erection of entire equipments.

- (c) Electrical wiring diagrams from engine-alternator set to Electrical control panel, Electrical control panel to synchronisation panel including the sizes and capacities of the various electrical/ control cables and equipment.
- (d) Dimensioned drawings of Acoustic enclosure/ Engine- Alternator set and Electrical control panel.
- (e) Drawings showing details of supports for pipes, chimney cable trays, ducts etc.
- (f) Any other drawings relevant to the work.

## **TESTING**

Routine Tests/Acceptance test shall be conducted on the DG Set as per relevant IS standard amended up to date. Client/Consultant shall have the right to inspect the progress of work, quality of materials used/ workmanship and to witness the Routine tests after completion of work at the premises of the manufacturer. The contractor shall give at least 15 days advance information to Client/Consultant about the manufacturing and Routine/acceptance tests plan so that Client/Consultant can attend the same.

Tests reports shall be submitted for Client/Consultant review and records.

## **3.0 LT PANEL BOARDS**

### **3.1 GENERAL**

This Section covers the detailed requirements of medium voltage switch gear Panel for 415V, 3 phase 50Hz 4 wire system. All switchgears shall be fully rated at an ambient of 400 C. The switch boards are to be fabricated by a firm having CPRI test certificate for short circuit rating and IP classification etc for similar panels and comply Form 4 for panel boards.

### **3.2 Switch Board Construction**

The switch boards are to be manufactured/assembled as per the latest BIS specifications, IP42 classification for indoor duty, IP54 classification for outdoor duty, including special requirements of state/ Central Electrical Inspectorate and the detailed specifications mentioned. The panel shall be floor mounted, free standing type, suitable for indoor installation in dust, vermin, weather proof construction and extensible type. The design shall include all provisions for safety of operation and maintenance personnel. The general construction shall conform to IS: 8623/1993 for factory assembled switch board.

### **3.3 Housing Details**

The Switch Board shall be fabricated out of 14 SWG (2mm) sheet steel for frame and 1.5mm for door and internal partitions (except load bearing members). It shall be provided with hinged doors on the front with necessary handles and earthed using

flexible copper conductor. The doors shall be provided with neoprene gaskets. Suitable channel base frame should be provided for the panel board.

Detachable gland plates of 3mm thick shall be provided at the bottom and top of the cable chamber, suitable for the termination of cables with compression type glands to the sizes as specified. Adequate space should be provided in the cable chamber for safe bending and termination of cables.

The enclosure shall be provided with lifting hooks, supporting legs and double earth terminals with double washers.

The switch board shall be in cubicle design (each feeder components are housed in individual cubicle) and fully compartmentalized having total segregation between each cubicle. Suitable cable and busbar alleys shall be provided. All components of the switch board shall be approachable from front. The Busbar chamber cover should be bolted type. The maximum operating handle/push button height of any feeder shall not be more than 1800 mm with reference to panel bottom. Supporting arrangement for dressing of power and control cables in cable alleys also shall be provided. The front openable/lockable door shall act as a cover for the switch boards. When door is open no live parts are accessible from the front door open case. The busbar should be extendable at both ends. No busbar should be protruded in the cable alley. Wherever necessary, such sheet steel members shall be stiffened by angle iron frame work. General construction shall employ the principle of compartmentalization and segregation for each circuit. Unless otherwise approved, incomer and bus section panels or sections shall be separate and independent and shall not be mixed with sections required for feeders. Each section of the rear accessible type panel shall have hinged access doors at the rear. Overall height of the panel shall not exceed 2.4 meters. Multi-tier mounting of feeder is permissible. The general arrangement for multi tier construction shall be such that the horizontal tiers formed present a pleasing and aesthetic look. The general arrangement shall be approved before fabrication. Cable entries for various feeders shall be either from top or bottom. Through cable alleys located in between two circuit sections, either in the rear or in the front of the panel. All cable terminations shall be through gland plates. There shall be separate gland plate for each cable entry so that there will not be dislocation of already wired circuits when new feeders are added. Cable entry plates shall therefore be sectionalized. The construction shall include necessary cable supports for clamping the cable in the cable alley or rear cable chamber.

Cubicle panels with more than 1000 Amps BUS shall be made of tested structural modular sections.

### **3.4 Powder coating**

All metal sheets shall undergo 9 tank metal treatment, thorough pre degreasing, degreasing, water rinse, derusting, water rinse, activation, phosphating, water rinse and then passivation. All metal surfaces shall be thoroughly cleaned and degreased to remove all scales, rust, grease and dirt. Fabricated structures shall be pickled and treated to remove any trace of acid. The undersurface shall be made free from all imperfections before undertaking powder coating.

The colour of the Panel shall be seimens grey, how ever the contractor shall obtain details of approved colour from the Engineer-in-charge before powder coating.

Panel finish shall be free from imperfections like pin holes, orange peels, run-off paint, etc.

All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust, corrosion, etc.

### **3.5 Insulation resistance to earth:**

This is to be measured with all fuse links in place, all switches, all lamps and appliance in position by applying a voltage not less than twice the working voltage (subject to a limit of 500V). Insulation resistance of the whole or any part of the installation to earth must not be less than 50 Megaohms divided by the number of outlets. In any case it should not be less than 1 Megaohm for the whole installation.

### **3.6 Insulation resistance between conductors:**

Test to be made between all the conductors connected to one pole or phase conductor of the supply and all the conductors connected to the middle wire or neutral or the other pole or phase conductors of the supply. For this test, all lamps shall be removed and all switches put on. The result of the test must be 50 Megaohms divided by the number of outlets (point and switch positions) .In any case it should not be less than 1 Megaohm for the whole installation.

### **3.7 Busbar sizing connection and supports:**

The busbars shall be made from high conductivity electrolytic grade aluminium alloy conforming to IS 5082. The busbars and supports shall be capable of withstanding the rated and short circuit current as per the single line diagram/ feeder details. Minimum size of main power bus bars shall be of incommer switch rating and interconnecting busbar to feeders should be rated to switch rating. Maximum current density permissible for Aluminium bus bars shall be 0.8 Amps/Sq.mm without considering derating factors. An earthing busbar size shall be suitable for with standing the fault current and minimum 150 sq.mm section copper shall be provided outside panel at bottom throughout the length of the panel.

The bus bar system may comprise of a system of main horizontal bus bars and ancillary vertical bus bars run in bus bar alleys on either side of which the circuit could be arranged with front access cable entries. In the case of rear access, horizontal bus system shall run suitably either at the top or bottom. All connections to individual circuits from the bus bar shall preferably be solid connections.

The busbars shall be provided with heat shrinkable PVC insulating sleeve. Supports for busbars shall be made of suitable size cast resin ribbed insulators or SMC/DMC solid block type base and these should be adequate in number so as to avoid any sag in the busbars. (Hylam supports may not be used)

Minimum clearance between phase to phase shall be 32mm and that between phase to neutral/ earth shall be 26 mm.



The entire panel shall have a common earth bar of size as specified with two terminals for earth connections.

### **3.8 Power Connection**

- a) For power interconnections within the panel board

Rigid Aluminium conductor, with PVC insulation, of adequate cross section i.e., current carrying capacity not less than the outgoing switch rating shall be used. Cable lugs/ sockets of suitable size and type shall be used for all interconnections.

For incoming and outgoing feeders of the switch boards, Aluminium conductor cable will be used and hence the panel has to be designed for receiving these and wherever required cable boxes shall be provided in panel by removable gland plates and shall be provided on top/bottom of panel, for cable entries.

In case of panel boards having bus duct as incomer, the panel board should be designed to accommodate proper connection/termination of the bus duct.

To prevent accidental contacts, all interconnecting cables/ busbars and all terminals also shall be shrouded.

Provision for clamping the cables inside the cable alley should be provided.

Standard colour code of red, yellow and blue for phases and black for Neutral to be followed for all busbars/conductors.

- b) Auxiliary wiring and Terminals

Wiring for all controls, protection, metering, signaling, etc. inside the switchboard shall be done with 650 volts grey colour minimum 1.5sq. mm HFFR (Halogen free fire retardant) copper conductor cables. Control wiring to components fixed on doors shall be flexible type. CT wiring shall be done with minimum 2.5 sq mm wires with colour code.

Wiring shall be suitably protected within switch board. Runs of wires shall be neatly bunched, suitably supported and clamped. All control wiring meant for external connections are to be brought out of terminal board.

The complete panel would be sub-divided into different sections and each section shall have its own control circuit with fuse and indication.

All control wiring should be provided with necessary cable sockets/ lugs at both ends. Conductors shall be terminated using compression type lugs. Each termination shall be identified at both the ends by PVC ferrules.

The identification termination numbers should match with those on the drawings.

### **3.9 Component of switch boards**

The panel shall be provided with ACBs, MCCBs, SDFUs, fuses, meters, relays and instruments, PLC etc. of size, capacity as specified in schedule of quantities and specification. The switch gears should be positioned inside the panel board as per manufacturers standards.

#### **3.9.1 Moulded Case Circuit Breakers**

##### **General**

Moulded case circuit breakers (MCCBs) shall be incorporated wherever required and shall be of **current limiting type** and preferably **double break**. MCCBs shall conform to IS 13947-1/IEC 60947-1 for general rules and IS 13947-2/IEC 60947-2 for circuit breakers in all respects. MCCB shall be suitable for isolation as per standard, single phase 240V or three phase 415 V, 50Hz, AC and shall have a rated insulation voltage of 750 V AC. The MCCBs shall have thermal memory and shall have no Line-Load restriction. All the breakers shall have tropicalisation as a standard feature.

##### **Construction**

The MCCB case & cover shall be made of high strength heat resistant and flame retardant thermosetting insulating material.

The operating handle shall be quick make, quick break trip free type. The operating handle shall have suitable 'ON', 'OFF', 'TRIPPED' indicators.

In order to ensure suitability for isolation complying with IS13947-2/IEC 60947-2, the operating mechanism shall be designed such that the toggle or handle can only be in 'OFF' position.

Three phase MCCBs shall have a common operating handle for simultaneous operation and tripping of all the three phases.

##### **Rating & Breaking Capacity:**

The rating of the circuit breaker shall be as per the drawings and schedule of quantities.

The MCCB shall have Service Breaking Capacity (Ics) equal to Ultimate Breaking capacity (Icu).

The Breaking Capacity (Icu) in kA for different ratings at 415V AC, 50Hz, 0.2 p.f shall preferably be as follows:

## **Protection**

All breakers (except MCCB Isolator) shall have micro-processor/ thermal magnetic based trip unit as specified in SOQ with adjustable overload protection from 40% to 100% in the case of microprocessor based and 80% to 100% in the case of thermal magnetic based of the nominal current( $I_n$ ). The short circuit protection should be adjustable from 2 to 10 times the rated current( $I_r$ ) with tripping time fixed. The Instantaneous Short Circuit protection to be fixed, without any time delay at 11 times the nominal current( $I_n$ ).

The microprocessor control unit shall have - true RMS sensing , Electromagnetic compatibility(EMC), thermal memory. The mP release shall be immune to harmonics.

630A MCCBs shall have fault indication of (O/C, S/C and E/F).

The MCCBs shall be **possible to fully co-ordinate** the over-load & short-circuit tripping of the circuit breakers with the upstream and downstream circuit breakers **to provide Total Discrimination.**

**MCCB should have the flexibility of connecting the load either on the top or on the bottom side with out deration.**

## **Accessories**

MCCBs shall be provided with the following accessories and all these devices shall be fittable at site. The **accessories** shall be seperated from Power circuit. Preferably the Shunt trip release and undervoltage release shall be **snap-in type** and fitted with terminal blocks.

Shunt trip  
Auxiliary switch  
Extended rotary Handle.  
2 NO + 2NC auxilliary contacts

## **Interlocking**

MCCBs shall be provided with the following interlocking devices for interlocking the door of the switchboard.

Handle interlock to prevent unnecessary manipulations of the breaker.  
Door interlock to prevent door being opened when breaker is in ON position.  
Door-interlock defeat to open the door even if the breaker is in ON position.  
Front operated rorary handle should have OFF-position pad-locking facility.

### **3.9.2 Measuring instruments**

These shall be of square pattern having dimensions of 96x96 mm flush mounting type. Instruments like Multifunction Meter, ammeter, Voltmeter, frequency meter etc. and instrumental transformers/ transducers etc. are also included in the scope of supply. All Multi Function Meters shall be

communication capable with RS 485 port and Modbus / TCP IP/ Backnet protocol

The accuracy class of all AC meters shall be as per schedule of quantity.

Voltmeter shall be suitable for direct line connection. Voltmeters shall be connected through MCBs only.

All voltmeters shall be provided with selector switches as per schedule of quantity.

Ammeters shall be CT operated wherever specified.

Current Transformers (CTs)

CTs shall be cast resin insulated type. Primary and secondary terminals shall be marked indelibly. CTs shall preferably be mounted on stationery parts. CT rating and ratios shall be as per feeder ratings. These shall be capable of withstanding momentary short circuit and symmetrical short circuit current for 1 second. Neutral side of CTs shall be earthed. Protection CTs shall have low reactance, accuracy class "5P" and an accuracy limit factor greater than "10". Instrument CTs shall be of accuracy class "1.0" and accuracy limit factor less than "5.0".

### **3.9.3 Connection**

Connections to the busbars shall be made by drilling holes. However, no holes shall be left in the busbars except at the both ends of the main busbar for panel extension. The bolts & nuts used for connections to busbars shall be of Aluminium alloy of tinned forged brass. For tapping of connections from busbars suitable size PVC sleeved copper conductor (minimum size 4.0 Sq.mm) shall be used with suitable size and type of crimped lugs/cable sockets. For connection of feeder above 63 Amps only busbar links with heat shrinkable PVC shall be used. Suitable size cable boxes shall be provided for incoming/outgoing cables. For all outgoing cables, cable alleys of suitable sizes in sides and tops, as required for proper cable connections/laying inside the panel, shall be provided. Switch board shall be suitable for Aluminium conductor PVC insulated incoming and outgoing cables. Removable gland plates shall be provided for cable entries.

### **3.9.4 Earthing**

Two independent earthing points shall be provided outside the panel near bottom and these shall be inter-connected with Cu earthing busbars of minimum size 25 x 6 mm. All earthing points inside the distribution board shall be interconnected to these earthing points with suitable size copper conductor.

### 3.9.5 Name plates

Switch board/distribution board shall be provided with danger plate and name plates for all incoming and outgoing feeders. These name plates shall be of PVC (blue colour base & white letters engraved) screwed to panel. The size of each letters shall be 15mm x 10mm for Panel Board Identification name and remaining details shall be appropriate size and it shall be clearly visible from 1.5 meter away from the panel. PVC identification ferrule numbers shall be used for all internal wiring. The name plate shall contain the following information.

- Panel Board Identification name & number
- Feeder name.
- Switch/ fuse rating.
- Cable size.
- Feeder Cable from ...../ to.....

### 3.9.6 Supports

Busbars shall be rigidly fixed to the supports, of SMC/DMC solid block type base. Busbars shall be firmly held within the slots in sheet type supports, which in turn shall be rigidly fixed to the chamber.

Clearances

The minimum clearances to be maintained for enclosed indoor air insulated busbars for medium voltage applications shall be as follows:

Between	Min. clearances
Phase to earth	26 mm
Phase to phase	32 mm

### 3.9.7 Indicating Lamps

On all the incomers of M.V panels, ON/OFF/TRIP indicating LED lamps shall be provided, wherever specified and shall be suitable for operation on AC supply. Phase indicating LED lamps shall be associated with necessary control MCB.

Type in built	:	Panel mounting wide band LED type with surge suppressor to protect LED against switching surges and built-in low voltage glow protection of 25V.
Standards applicable	:	IEC 947-5-1
Diameter	:	22mm
Operating voltage	:	240V AC

Illumination Level : Minimum 100 lux on the front face of the lens.

Colour of lamps : as per standards

### **3.9.8 Arrangement of busbars and main connections**

Busbars and main connections, which are substantially in one plane, shall be arranged in the order given below:

- i) AC. System
  - a) The order of phase connections shall be red, yellow and blue.
  - b) When the run of the conductors is horizontal, the red shall be on the top or farthest away as viewed from the front.
  - c) When the run of the conductors is vertical, the red shall be on the left, or farthest away as viewed from the front.
  - d) When the system has a neutral connection in the same plane as the phase connections, the neutral shall occupy the bottom position if horizontal and extreme right if vertical, or nearest position when viewed from the front.
  - e) Unless the neutral connections can be readily distinguished from the phase connections, the order shall be red, yellow, blue and black.

### **3.9.9 Intelligent Power factor Controller**

Intelligent Power Factor Controller relay should have in built microprocessor with fast computerised program and should have following features.

- Automatic self adjustment to required kVAR value.
- Digital display of Power factor, Stage indication and preset PF target,C/K.
- Manual Operation.
- Different Programmable Capacitor banking programs to provide flexibility to match plant conditions.
- Time delay on reconnection of charged capacitors to reduce damage and extend capacitor life.
- No Volt release.
- Lead and lag power factor indication.

- Harmonic overload alarm.
- Over voltage alarm.
- Digital setting of CT primary current, Harmonic level and first capacitor current value.

#### Technical Specification of IPFCR

Voltage input	:	440V +/- 15%
CT ratio	:	/5
Frequency	:	50 Hz.
Auxiliary supply	:	240V.
Number of stages	:	as specified in SOQ.
C/K adjustment	:	Automatic
PF adjustment	:	0.8 lag to 0.98 lead
Switching sequence required	:	Automatic self adjustment to kVAR
Low voltage release	:	< 35m Sec.
Low current release	:	< 200mA.
Harmonic over load trip point	:	If it is more than the set THD.
Working Temperature range	:	-10 to 50 deg.

#### 3.9.10 Contactors

Contactors shall comply with IS 13947 :1 for general rules and IS13947-4-1 for standards pertaining to contactors and motor starters. The contactor shall be capable of withstanding breaking & making capacities per following:

The components (Over Load Relays and Contactors-main & auxiliary) inside the motor feeder shall be selected to meet Type-2 Co-Ordination and MCCB as indicated in single line schematic. Contactors shall be of AC-3 duty. Single phase preventers shall be provided for each motor feeder. The starters upto 15KW shall be selected to meet Total Co-ordination.

Motors for Blower fans, Agitator, compressors shall be provided with heavy-duty type Starters & suitable over load relays with delayed start time to take care of the long starting time.

Contactors shall be suitable for copper terminations with a maximum permissible temperature rise of 65°C at the terminals with an ambient temp of 50°C.

The coil shall have 3 terminals and the insulation class shall be preferably H class. The auxiliary contact block shall have a switching capacity of 440V at 2A.

Contactors shall have one auxiliary in-built and it shall be possible to have additional NO & NC contacts in steps of two.

The power contactors for capacitor switching should be of capacitor duty type with provision for reducing inrush current through a resistor, which closes prior to closing of the main contact.

### **3.9.11 Capacitors**

Capacitor should be of heavy duty double dielectric poly propylene type.

All capacitors shall be of loss less than 0.5 W / kVAr, suitable to withstand + 10% voltage variation and rated for operating temperature up to 70°C.

Capacitor units shall be provided of rating specified in SOQ with externally mounted discharge resistors to reduce the residual voltage to less than 50 volts in one minute of switching off. Timer shall be provided in the circuit so that supply is not restored before discharge of the capacitor Bank.

Each capacitor unit shall be capable of operating continuously at 10% over voltage over and above the rated RMS voltage.

### **3.9.12 Push Buttons**

1	Type	:	Manually operated spring return type.
2	Standard applicable	:	IEC947-5-1
3	Electric Shock protection	:	Class 2 (IEC 536)
4	degree of protection	:	IP54 (IEC529)
5	Diameter	:	22mm
6	Type of mounting	:	snap type
7	Color of actuator	:	Start PB - Green Stop PB - Red Test/Reset PB - Black
8	Contact configuration	:	2NO+2NC



### 3.9.13 Automatic Transfer Switches with AMF Controller

#### ATS Switch :-

Furnish and install automatic transfer switches with AMF Controller (ATS) with number of poles, amperage, voltage, and withstand current ratings as per the SLD. All transfer switches should be as per IEC60947-6-1 standards with minimum AC33B utilization category. The automatic transfer switch consists of an intelligent controller and Modular load break switch which automatically transfers the load to the emergency power source when it detects under/over voltage, under/over frequency. Controller need to be provided with ATS switch that performs voltage sensing , Frequency sensing , Power loss , Phase loss ,under voltage , over voltage , over frequency , under frequency Transfer .

#### Controller

- Different Optional Modes (Source I priority /No Source priority)
- Controller Display Having Indicator -programming the features and settings, Switch position indicator lights, Source acceptability indicator lights on the front door panel.
- Controller should be capable of detection of under and over voltage settings on source I and source II, Under and over frequency settings on source I and source II, Voltage unbalance detection between phases, under frequency transfer ,over frequency transfer
- High frequency switching power supply, and wide power voltage range
- Diagnosis fault intelligent with self – protection function (Motor-Blocked)
- Center-off with time delay and center-off with protection - The center-off time delay can be set to avoid large current rushes to inductive loads, Center-off with protection is available to protect critical loads (e.g.Fire Pump)

#### Codes and Standards

The automatic transfer switches should meet following standards as per IEC:

- EN 60947-6-1 / IEC60947-6-1: transfer switching
- EN60947 -3 / IEC60947-3: Suitable for Isolation
- EN55022: Radiated and Conducted Emission, Class A
- EN61000-3-2: Harmonic Current Emission, Class A
- EN61000-3-3: Limits of Voltage fluctuation and Flicker
- EN 61000-4-5: Immunity to Surge

- EN 61000-4-4: Immunity to Electrical Fast Transient:
- EN61000-4-2: Immunity to Electrostatic Discharge
- EN61000-4-3: Immunity to Radiated Electric Fields
- EN 61000-4-6: Immunity to Continuous Conducted Interference

### **Power Switching**

- Rotating dual contactor design extinguishes the arc quickly and effectively
- Clamping contactors are self cleaning wiping action type
- High short circuit capability

#### **Switching Mechanism**

- Automatic or manual operation provided
- Unique contact design avoids contact bounce
- Electrical and mechanical interlocks prevent both sources being connected simultaneously
- Innovative motor breaking technique, provides precision control
- Cast steel bevel gear mechanism provides high transmission efficiency, and extended operating Life.

### **Synchronization**

#### Scope

This section covers synchronization of DG sets as required and comprises of running of DG set in parallel i.e. their synchronization on common bus bar, auto load sharing and auto load management, load dependent start stop and AMF. Provision for Manual Synchronising shall also be provided.

#### Control Philosophy

##### Automatic Start & Stop of Engine:

The system should come in operation after sensing of grid failure and automatically control the start & stop of engines, depending on the predefined load setting in the Synchronous Controller. In case engine does not start in the first cranking, two more auto commands should be given with proper intervals. Even then if engine fails to start, indication must appear on MMI(Man Machine interface). In the event the engines are under loaded i.e. load sensed is capable of being catered by less than the capacity of running DG sets then command must be given to stop required number of excess DG sets after running idle for short duration. Provision to select no. of DG sets to be started and synchronised at no load to cope up with sudden load without tripping the DG's should also be inbuilt into the system. Manual overriding facility shall be provided for Start/Stop/Running/Synchronizing & Load Transfer of DG sets.

##### Automatic Synchronisation:

The facility of synchronisation will be available in both Auto & Manual mode. In normal circumstances the auto synchronisation will work, however if due to any reason auto synchronisation fails repeatedly the facility for

Closer of switch gear must be available automatically. In manual mode switch gear shall be closed by panel push button.

Automatic Load Sharing:

The load sharing will also be automatic, by sensing both active & reactive power.

Back up Protection:

The system should also have following inbuilt protection other than external relays in synchronization panel.

Reverse power(32R)and Reverse Reactive power, Short circuit(50) ,Over current(51),Voltage-dependent over current(51V),Overvoltage(59),Under voltage(27),Over frequency(81O),Under frequency(81U),Unbalanced current(46),Under reactive power 32RV),Over reactive power (32FV),Over load(32),Vector Shift(78),df/dt(81R),Zero sequence current high(50G), Synchrocheck relay etc.

Due to any electrical fault Synchronous Controller shall trigger the master trip relay. These Synchronous Controller will be state of the art equipments using latest technology and of most rugged and reliable design. Since they shall be operating in the harsh & unfriendly environment of DG room, they will be suitable to operate trouble free in those conditions. The chosen equipment should be able to withstand high temperature, humidity & voltage fluctuations, thus making it suitable for the operating conditions described above.

Sequence of operation:

The following sequence of operation shall be achieved through Synchronous Controller based logic panel in addition to hardware interlocks as well as software interlocks:

#### AUTO Mode

1. GRID Healthy: - Entire Bus energized from EB incomer, All DG Breakers OFF
2. GRID Fail/Fault In GRID: - There is no supply from EB and give the start command to all DG & first healthy DG close their breaker on dead Bus & the entire bus is charged & rest of the DG start synchronization & after meeting all the condition of synchronization close their breaker one by one & as their breaker close they come in to the Active & reactive Load Sharing as per their rating percentage.
3. Load Management: - Now Load Management comes into the picture & as per the load condition controller automatically sense and shares the load to each DG Set according to capacity. Controller give the stop command to DG's if total load can be met by less no of DG's. If load exceeds start command will be given to meet the additional load to the available DG Set.

4. GRID Resumes: - When GRID resumes the DG Set's are off loaded and the DG breakers switched off one by one, DG come in the cool down mode & then shut down. Bus couplers are then switched off attaining normal mode of operation .

#### Manual Mode

For manual mode selection, Operator will select the option through selector switch for Manual Mode & all the relays should come in the manual mode. In manual mode ,DG Sets should be able to operate independently or in parallel. For manual mode operation operator will check the condition & act accordingly.

### **3.10 TESTING**

Routine Tests/Acceptance test shall be conducted on the LT Panels as per relevant IS standard amended up to date. Client/Consultant shall have the right to inspect the progress of work, quality of materials used/ workmanship and to witness the Routine tests after completion of work at the premises of the manufacturer. The contractor shall give at least 15 days advance information to Client/Consultant about the manufacturing and Routine tests plan so that Client/Consultant can attend the same.

Tests reports shall be submitted for Client/Consultant review and records.

### **4.0 CABLES & CABLING**

#### **4.1 Scope**

The scope under this section covers the following:

- a) Power cables
- b) Control cables

#### **4.2 Armouring and Serving**

All multicore cables liable for mechanical damage shall be armoured.

Cables, when armoured, shall have galvanised steel wire (flat or round) for armouring.

Steel wire armouring is preferred where the cables are liable to tensile stresses in applications such as vertical runs, suspended on brackets or laid in soil that is likely to subside.

### 4.3 Storage and handling

#### 1. Storage:

- (i) The cable drums shall be stored on a well drained, hard surface, so that the drums do not sink in the ground causing rot and damage to the cable drums. Paved surface is preferred, particularly for long term storage.
- (ii) The drums shall always be stored on their flanges, and not on their flat sides.
- (iii) Both ends of the cables should be properly sealed to prevent ingress/absorption of moisture by the insulation during storage.
- (iv) Protection from rain and sun is preferable for long-term storage for all types of cables. There should be enough ventilation between cable drums.
- (v) Damaged battens of drums etc. should be replaced, as may be necessary.

#### 2. Handling:

- (i) When the cable drums have to be moved over short distances, they should be rolled in the direction of the arrow marked on the drum.
- (ii) For manual transportation over long distances, the drum should be mounted on cable drum wheels, strong enough to carry the weight of the drum, and pulled by means of ropes. Alternatively, they may be mounted on a trailer or on a suitable mechanical transport.
- (iii) For loading into and unloading from vehicles, a crane or a suitable lifting tackle should be used. Small sized cable drums can also be rolled down carefully on a suitable ramp or rails, for unloading, provided no damage is likely to be caused to the cable or to the drum.

### 4.4 Standards

The following standards shall be applicable:

- 1. IS : 1753 : Specification for Aluminium conductors for insulated cables.
- 2. IS : 2982 : Specification for copper conductors in insulated cables.
- 3. IS : 5831 : Specification for XLPE insulated and PVC sheath of electric cables.
- 4. IS : 6474 : Polythene insulation and sheath of electric cables.
- 5. IS:3975 : Specification for mild steel wires, strips and tapes for armoring of cables.

6. IS : 694 : PVC insulated cables.
7. IS : 7098 : Specification for XLPE insulated PVC sheathed cables.
8. IS : 3961 : Recommended current ratings of cables.
9. IS : 5819 : Recommended short circuit ratings for high voltage PVC cables.

#### **4.11 Power cables (LV) 1.1kV grade XLPE insulated cable**

Power cables for use on 415 V system shall be of 1100 volt grade, Aluminium conductor, XLPE insulated, PVC sheathed, armoured and overall PVC sheathed cable, strictly as per relevant IS specification. Unarmoured cable to be used only if specifically mentioned in schedule of requirements. Bi-metallic plate washers should be provided wherever cables, lugs, and switch terminals are of different materials. Cables and cable lugs should be of same material where ever possible.

The size of these cables shall be as specified in schedule of requirements or as per erection drawings. No Aluminium conductor cable of size less than 4 sq.mm shall be used.

#### **4.12 Control Cables**

Control cables for use on 415 V system shall be 1100 volts grade, copper conductor, PVC/XLPE insulated, PVC sheathed, armoured/ steel braided and overall PVC sheathed, strictly as per IS : 1554 (Part I) – 1976 and IS 7098 part 1. Unarmoured cables to be used only if specifically mentioned in schedule of quantities. Control cable carrying current should be black colour and voltage circuit shall be of grey colour and shall be segregated.

The size of these cables shall be as specified in schedule of requirements or as per erection drawing. No cable of size less than 1.5 sq.mm. shall be used.

#### **4.13 Cable Glands**

Cable glands shall be of heavy duty double compression type of brass, chrome plated. These shall have a screwed nipple with conduit electrical thread and checknut. These shall be suitable for armoured/unarmoured cables, which is being used.

#### **4.14 Cable Connectors**

Cable connectors, lugs/sockets, shall be of copper/aluminium alloy, suitably tinned, solderless, crimping type. These shall be suitable for the cable being connected and type of function (such as power, control or connection to instruments, etc.)

#### **4.15 Cable Indicators**

These shall be self-sticking type and of 2 mm thick lead strap for overall cable. PVC identification numbers, ferrule shall be used for each wire.

#### **4.16 Cable Route Markers**

The specification of the cable route markers shall be as per SOQ.

#### **4.17 G.I. Pipes for Cables**

For laying of cables under floor, ground etc. G.I. class 'B' pipes shall be used. MS. conduits is not acceptable for this purpose. All accessories of pipes shall be threaded types. Size of pipe shall depend upon the overall outer diameter of cable to be drawn through pipe. No G.I pipe less than 40 mm dia. shall be used for this purpose. To determine the size of pipe, assume that 40% area of pipe shall be free after drawing of cable.

#### **4.18 TESTING**

Routine Tests/Acceptance test shall be conducted on the HT and LT cables as per relevant IS standard amended up to date. Client/Consultant shall have the right to inspect the progress of work, quality of materials used/ workmanship and to witness the Routine tests after completion of work at the premises of the manufacturer. The contractor shall give at least 15 days advance information to Client/Consultant about the manufacturing and Routine tests plan so that Client/Consultant can attend the same.

Tests reports shall be submitted for Client/Consultant review and records.

### **5.0 WIRING SYSTEMS**

#### **5.1 Materials**

##### **A. Wires**

Wires shall comply the following features:

- Flame Retardant Low Smoke grade (FRLS), suitable upto 660V grade wires for single phase circuits and 1100 V grade for 3 phase circuits as per IS 694/1990 amended upto date.
- Colour coded as below:

Phase - R	-	Red
Phase - Y	-	yellow
Phase - B	-	Blue
Neutral	-	Black
Earth	-	Green

## B. Conduits

Two types of Conduit Wiring System shall be followed.

### ➤ Rigid PVC Conduit Wiring System

#### i. General requirements:

- a) All rigid conduit pipes shall be ISI marked. The wall thickness shall be not less than 1.6 mm for conduit upto 32 mm dia and not less than 2 mm for conduits above 32 mm dia.
- b) The maximum number of PVC insulated cables conforming to IS:694-1990 that can be drawn in one conduit is given size wise in Table I, and the number of cables per conduit shall not be exceeded. Conduit sizes shall be selected accordingly in each run.
- c) No conduit less than 20 mm in diameter shall be used.

Flexible conduits will only be permitted for interconnections between switchgear, DB's and conduit terminations in wall.

#### ii. Conduit Accessories

- a) The conduit wiring system shall be complete in all respects, including their accessories.
- b) All conduit accessories shall be of solvent cement plastering type, and under no circumstances pin grip type of clamp grip type accessories shall be used.
- c) Bends, couplers, etc. shall be solid type in recessed type of works and may be solid or inspection type as required.
- d) for surface conduit work on wall shall not be less than 0.55 mm (24 gauge) for conduits up to 25 mm dia. and not less than 0.9 mm (20 gauge) for larger diameter.
- e) The minimum width and the thickness of girder clips used for fixing conduits to steel joists, and clamps shall be as per Table II.

#### iii. Outlets

- a) The switch box or regulator box shall be made of metal on all sides, except on the front. In the case of cast boxes, the wall thickness shall be at least 2 mm and in case of welded mild steel sheet boxes, the wall thickness shall not less than 1.2 mm (18 gauge) for boxes upto a size of 20 cm x 30 cm, and above this size 1.6 mm (16 gauge) thick MS boxes shall be used. The metallic boxes shall be duly painted with anticorrosive paint before erection.



- b) An earth terminal with stud and 2 metal washers shall be provided in each MS box for termination of protective conductors and for connection to socket outlet/metallic body of fan regulator etc.
- c) Clear depth of the box shall not be less than 60 mm, and this shall be increased suitably to accommodate mounting of fan regulators in flush pattern.
- d) The fan regulators can also be mounted on the switch box covers, if so stipulated in the tender specifications, or if so directed by the Engineer-in-charge.
- e) Except where otherwise stated, 3 mm thick phenolic laminated sheets as per clause shall be fixed on the front with brass screws, or cadmium plated iron screws as approved by the Engineer-in-charge.

**TABLE I**

MAXIMUM NUMBER OF PVC INSULATED 650/1100 V GRADE ALUMINIUM/  
COPPER CONDUCTOR CABLE CONFORMING TO IS: 694-1990 IN  
RIGID PVS/STEEL CONDUITS

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
1.5	5	4	10	8	18	12	-	-	-	-	-	-
2.5	5	3	8	6	12	10	-	-	-	-	-	-
4	3	2	6	5	10	8	-	-	-	-	-	-
8	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 size of conduits for a simultaneous drawing 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 columns headed **B** applies to runs of conduit which deflect from straight by an angle of more than 15 degrees.
- 3) Conduit sizes are the nominal external diameters.

**TABLE II**  
**GIRDER CLIPS CLAMPS**

Size of conduit	Width	Thickness
20 mm	19 mm	0.9 mm (20 SWG)
25 mm	19 mm	0.9 mm (20 SWG)
32 mm & above	25 mm	1.2 mm (18 SWG)

**UPVC trunking system :**

Trunking shall be provided to route the power and data cables under the floor. The raceways shall be fabricated out of UPVC material. The width and thickness shall be as specified in boq. The entire length shall be split into units of length 2.4 m (minimum) which shall be coupled through jointing sleeves. The system should be compartmentalized for provision of data, power and voice cables.

**Junction boxes:**

Junction boxes shall be provided for direct access to cables at the intersection of raceways. Also they should have the provision to route and distribute either the power and network cables. The junction boxes should have adjustable height with a minimum height of 45 mm.

**Pop-up boxes :**

Pop-up boxes shall be provided to accommodate switches and sockets. Three types of modules are proposed for the pop-up boxes. 2X4 module shall be used for computer points, 3 module for combined 5/6 Amps switch –socket /data and telephone socket, 4 module for combined 15/16 Amps switch-socket . Flush mounting boxes shall be used for installation in concrete floors. Pop-up boxes shall be equipped with ‘push and slide ‘locking system to avoid accidental opening by feet. The top cover shall be with stainless steel /brushed brass/gold finish.

**Service outlet box:**

Floor service outlet boxes shall be provided for fixing modules to accommodate switch and sockets, for drawing out cables etc. Three module circular service outlet

boxes shall be used. For installation purpose, floor mounting boxes shall be considered in concrete floors.

## 5.2 WIRING

### A. POINT WIRING

#### i) Definition

A point (other than socket outlet point) shall include all works necessary in complete wiring to the following outlets from the controlling switch or MCB. The scope of wiring for a point shall, however, include the wiring work necessary in tapping from another point in the same distribution circuit: -

- (a) Ceiling rose or connector (in the case of points for ceiling /exhaust fan points, pre-wired light fittings and call bells).
- (b) Ceiling rose (in the case of pendants except stiff pendants).
- (c) Back plate (in the case of stiff pendants).
- (d) Lamp holder (in the case of gooseneck type wall brackets, batten holders and fittings which are not pre-wired).

In the case of call bell points, the words “from the controlling switch or MCB” shall be read as “from the ceiling rose meant for connection to bell push”.

#### ii) Scope

##### (a) **Following shall be deemed to be included in point wiring.**

- 1) Conduit, accessories for the conduit and wiring cables between the switch box and the point outlet.
- 2) Ceiling rose or Connectors shall be provided near the fitting as required.
- 3) For points coming in false ceiling, as far as possible, wiring shall be terminated in a junction box/connector very close to the points.
- 4) For points coming in false ceiling, all conduits shall be adequately supported. For this purpose, MS supports shall be provided as specified in SOQ as a separate item.
- 5) Loop wiring in rigid/flexible conduit
- 6) All fixing accessories such as clips, nails, screws, Phil plug, raw plug etc. as required.
- 7) Metal switch boxes for control switches, regulators, sockets etc. recessed or surface type, outer & inner cover plates in case of modular type switches.

- 8) Outlet boxes, junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
- 9) All the civil works such as chipping, plastering, Making good all damages connected with the fixing of switch boxes, conduit laying etc are included in the scope.
- 10) Control switch as specified.
- 11) Connections to ceiling rose, connector, lamp holder, switch etc.
- 12) Interconnecting wiring between points on the same circuit, in the same switch box or from another.
- 13) Loop earthing in rigid/flexible conduit
- 14) Protective (loop earthing) conductor from one metallic switch box to another in the distribution circuits, and for socket outlets.

**B. Following shall be deemed to be included in group control point wiring.**

- 1) Conduit, accessories for the conduit and wiring cables between the Control location (DP/SP MCB/Isolator/ DP switch) to the first point and wiring cable between points forming the particular number of group (providing MCB or switch is not included in this scope).
- 2) Ceiling rose or Connectors shall be provided near the fitting as required.
- 3) For points coming in false ceiling, as far as possible, wiring shall be terminated in a junction box/connector very close to the points.
- 4) For points coming in false ceiling, all conduits shall be adequately supported. When large number of points comes in false ceiling, conduits shall be run in adequate steel supports/tray. The size and cross section of the above mentioned supports shall be planned as per the site condition and got approved by the engineer in charge before commencing the work. MS supports provided shall be as specified in SOQ and will be a separate item.
- 5) Loop wiring in rigid/flexible conduit
- 6) All fixing accessories such as clips, nails, screws, Phil plug, rawl plug etc. as required.
- 7) Junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with MCBDB for loose wires/conduit terminations.
- 8) Connections to ceiling rose, connector, MCB etc.
- 9) Loop earthing in rigid/flexible conduit

### C. CIRCUITS AND SUBMAIN WIRING

#### i) Circuit wiring

Circuit wiring shall mean the wiring from the distribution board up to the tapping point for the nearest first point of that distribution circuit, viz. Upto the nearest first switch box.

#### ii) Sub main wiring

Sub main wiring shall mean the wiring from one main/ distribution switchboard to another.

### D. WIRING IN CONDUIT

The wiring in conduit shall comply the following:

#### ➤ Wire sizes

	<b>Copper conductor</b>
Light point / Sub main wiring	1.5 sq.mm
Light Circuit Point	2.5 sq.mm
Power points	4.0 sq.mm
Machinery	As per Schedule of requirements

Jointing of wires is not permissible, however looping may be done from point (same circuit) or using a terminal strip in junction box where site condition warrants, prior permission from Engineer-in-Charge shall be obtained.

Metallic/non-metallic trunking may be used if number of conduits are many. The metallic trunking shall be earthed securely at DB end and throughout the length. Single trunking with metallic partition may be used for wiring different services.

### E. WIRING ACCESSORIES

#### i) Control switches for points

(a) Control switch shall be placed only in the live conductor of the circuit. No single pole switch or fuse shall be inserted in the protective (earth) conductor, or earthed neutral conductor of the circuit.

(b) Combined switch cum socket shall not be permitted.

#### ii) Socket outlets

(a) The 5A/6A socket outlet shall be 5 pin socket outlet with 5A/6A switch, where so specified in the tender documents.

- (b) The power point outlet shall be 15A/5A or 16A/6A 6 pin socket outlet with 15A/16A switch, where so specified in the tender documents.
- iii) Switch box covers
- Modular type switches/ sockets suitable outer and inner cover plates as specified shall be provided over the standard box as recommended by the manufacturers of modular type switch/ sockets and no separate sheet cover is required to be provided.
- iv) Ceiling rose
- (a) Ceiling rose shall be of 3-plate type.
  - (b) A ceiling rose shall not be used on circuit the voltage of which normally exceeds 250V.
  - (c) Only one flexible cord shall be connected to a ceiling rose. Specially designed ceiling roses shall be used for multiple pendants.
  - (d) A ceiling rose shall not embody fuse terminal as an integral part of it.
  - (e) Where ever ceiling roses are not used the wires are to be terminated in good quality connectors of 6A capacity inside PVC junction boxes.
  - (f) All the junction boxes are to be covered with good quality round cover plate of approved colour.
- i) Lamp holders
- (a) The standard constructional feature of manufacturers (ISI approved) of lamp holders is acceptable.
  - (b) Where the lamp holders are part of light fixtures the holders shall be suitable for the type of lamps used.
- F** Technical specification of floor trunking system, junction boxes, pop-up boxes , heavy duty screed floor boxes, service outlet box etc.

## **6.0 M C B DISTRIBUTION BOARDS (MCB DBS) AND ACCESSORIES**

### **A) M C B Distribution Boards (MCB DBs)**

All SPN & TPN DBs are to be MS powder coated suitable for flush mounting with double door and to be provided with inbuilt additional compartment for looping of loose wires/adaptor boxes for entry of armoured cables with IP 42/43 category of protection and conform to IS: 8623.

i) Material

The DBs are to be fabricated out of CRCA sheets suitable for all weather operation. The current carrying parts are to be made of electrolytic grade copper and are to be rated for the duty intended. The DBs should have knock out holes at the bottom, and detachable plate with knock out holes at the top.

ii) Painting

The DBs are to be subjected to seven tank phosphatising processes (Degreasing, pickling, surface activation, phosphatising and passivation) and to be powder coated ensuring rust prevention and scratch resistant.

iii) Accessories

Following accessories are to be provided: -

- (a) Copper bus bars of rated current capacity per phase.
- (b) Special brass terminals to ensure perfect connections of incoming cable with the bus bars.
- (c) Brass neutral bars three numbers, one for each phase, isolated and insulated from the enclosures with suitable cross sectional area.
- (d) Earth bars for firm earthing and for facilitating individual earthings for each outgoing terminal.
- (e) Sufficient number of blanking plates.
- (f) Provision for accomodating four pole MCB and RCCB as incomer.

**B) Miniature Circuit Breakers (MCBs)**

All MCBs should conform to IS:8828(1996), BS: 3871, IEC:898(1995) and rated for 10kA category of short circuit duty and tested for breaking capacity upto 10 kA. **B** curve type MCBs should be used for resistive loads, **C** curve type for inductive loads and **D** curve type for UPS loads. MCBs shall be suitable for use in frequency range 40 Hz to 60 Hz and shall accommodate AC/DC supply according to requirements. It should have inverse time overload and short circuit tripping mechanism with trip free operation and toggle shall give positive contact indication. Arc chutes should be provided for effective quenching of arc during operations and fault conditions. Terminals should be provided with proper shrouding arrangement. Silver cadmium Oxide tipped contacts should be provided in MCBs. Pressure clamp terminals for users upto 4 sq.mm and bolted lugs for higher rating should be provided. Multipole MCBs should be provided with common operating handle

and integral tripping. The MCBs shall be of IP 20 degree of protection. The power loss per pole shall be in accordance with IS:8828(1996) and shall be furnished by the manufacturer.

MCB casing shall be made of self extinguishing tropicalised material. It shall be suitable for mounting on 35 mm DIN rail/surface mounting. Line supply may be connected to either top or bottom terminals i.e there shall be no line load restriction. Degree of protection, when the MCB is flush mounted, shall be IP 40. MCB shall be supplied with clamping terminals fully open. Contact closing shall be independent of the speed of the operator. The MCB shall be capable of being used as incomer circuit breaker and shall be suitable for use as an isolator. In case of multiple MCBs in a single location (DB), it shall be possible to remove MCB without having to disturb other MCBs in the vicinity. All MCB's shall be capable of carrying 35sq.mm. cable termination. Both the upper and lower terminals of MCB's shall be bi-connect type, ie., capable of connecting busbar and cable at both the end.

**C) Residual Current Circuit Breaker with Overload protection (RCCB/RCBO)**

Residual Current Circuit Breakers based on residual current operation should provide complete protection against Earth leakage faults. The breakers should conform to IS: 12640-1988, IEC 601008-1 and IS: 8828-1996 should be rated for 6 kA or more. The RCCB shall have threshold sensitivities (non-user adjustable) of 30mA, 100 mA mA with inbuilt time delay of 200 ms for discrimination with downstream RCCB. The short circuit withstand capacity of the RCCB shall not be less than 6 kA. It shall be operationally independent of line voltage. The breaker should be maintenance free. The breaker should be capable of detecting earth leakage currents and disconnecting the faulty lines. **The RCBO should be capable of preventing the risk of unwanted tripping due to transient voltages (lightning, line disturbances on other equipment) and transient currents (from high capacitive circuits). The RCBO should be unaffected by the DC pulsated components, present if any in the circuit, and should not give nuisance tripping.** A test devise should be incorporated to check the integrity of the system and tripping mechanism. Terminals should ensure easy termination of cables and should provide covers to shield incoming and outgoing terminals with IP 20 degree of protection. The breaker should be suitable for DIN rail mounting. All RCBO's shall be capable of carrying 35sq.mm. cable termination. Both the upper and lower terminals of RCBO's shall be bi-connect type, ie., capable of connecting busbar and cable at both the end.

**7.0 LIGHT FIXTURES AND FANS**

7.1 The type of fittings shall be as specified in SOQ of tender documents.

- i) The contractors shall supply the specified model and make of the fittings. The standard constructional features of specified make and model as given in the tender document are acceptable. However, one sample of each of every fitting shall be produced for approval.



- ii) Though a particular model number of a fitting is mentioned in the tender, Client reserve the right to reject the make if the quality of these fitting is found to be not up to the standard.
- iii) The contractors shall supply the specified type of lamp mentioned in the SOQ. All the accessories of the light fittings should be fitted with nut bolt and not to be riveted.
- iv) Ceiling fans including their suspension shall conform to relevant Indian Standards.
- v) Wall Fans, Air Circulators, Exhaust fans etc. shall conform to relevant Indian Standards.
- vi) The colour temperature of LED should be in the range of warm white and cool white according to the architect's concept.
- vii) Fittings using discharge lamps shall be complete with power factor correction capacitors, either integrally or externally. An earth terminal with suitable marking shall be provided for each fitting for discharge lamps.

## **8 EARTHING AND LIGHTNING PROTECTION**

### **8.1.1 General**

All cladding or steel work should be bonded to the earthing system, as should all structural steel work. A main earth bar should be provided, so disposed as to allow of the shortest subsidiary connections to all major equipment, such as DG set, VCB Panels, Substations, circuit breakers and electrical panel boards. When piles are used they should be bonded by welding and connected to earth bonding bars. All earth connections shall be visible for inspection.

- i) Electrode materials and dimensions
  - a) The materials and minimum sizes of earth electrodes shall be as per fault level calculation.
  - b) Chemical pipe earthing with 4m long electrode shall be buried in ground in vertical. The installation shall be carried out as per IS:3043 and as directed by the engineer in charge.
  - c) When more than one electrode is to be installed the distance between the pipe electrode shall be 5m and that between plates shall be 8m.
  - d) The strip or conductor electrode shall be buried in trench not less than 0.5m deep.

- e) If the conditions necessitate the use of more than one strip or conductor electrode, they shall be laid as widely distributed as possible, in a single straight trench where feasible, or preferably in a number of trenches radiating from one point or as directed by the Engineer-in-charge.
- f) All joints in copper conductor should be tinned properly.

### **8.1.2 Earthing Conductor**

- a) The earthing conductor (protective conductor from earth electrode upto the main earthing terminal/earth bus, as the case may be) shall be of the same material as the electrode, viz. GI or copper, and in the form of wire or strip as specified.
- b) Protective (Earth continuity/Loop earthing) Conductor
- c) The material and size of protective conductors shall be as specified by the Engineer-in-charge.

### **8.1.3 Location for Earth Electrodes**

Normally an earth electrode shall not be located closer than 1.5 m from any building. Care shall be taken to see that the excavation for earth electrode does not affect the foundation of the building; in such cases, electrodes may be located further away from the building, with the prior approval of the Engineer-in-Charge.

### **8.1.4 Protective (Loop earthing/earth continuity) Conductor:**

- i) Earth terminal of every switchboard in the distribution system shall be bonded to the main earth bus.
- ii) Two protective conductors shall be provided for a switchboard.
- iii) A protective conductor shall securely connect the earth connector in every distribution board (DB) to the earth bus.
- iv) All metallic switch boxes and regulator boxes in a circuit shall be connected to the earth connector in the DB by protective conductor.
- v) Provision should be given for the testing of earth electrodes by connecting a group of rod driven electrodes to the main earth grid through a bolted link adjacent to the electrodes in a sunken concrete box. Simpler disconnecting arrangements are not acceptable.

### **8.1.5 Chemical/mineral Earthing**

Providing Earthing system as per IS 2309 ,IEC 62305 part3, IEC 60364, IEC 62561 part 2, IS 3043, UL 467 & UL 96 standards. Maintenance free earthing arrangement to carry fault current with 250 microns molecularly copper bonded solid

high carbon steel rod of diameter 20mm and minimum length 4 Meters (1 meters\*4) tested for 10/350 micro second wave form , stainless steel connectors and fasteners for connecting electrode with earthing conductor/strip,e with earth enhancing mineral compound is recommended as per above mentioned standards. The electrode shall be hand driven or hammered in to earth for soft soil and drilling for rocky and hard soil.

Earthing System comprises of molecularly bonded copper of 99.9% purity on low carbon steel of 4m length (1m (219 20 CU) x 4 nos), having a diameter of 20mm with copper coating thickness of 250 microns with self-coupling bore and peg arrangement (without the need for external coupler) with fault current withstand capability of 15 KA rms value for 1 second. For obtaining desired length, the number of rods shall be increased and is provided with Universal Clamp (2730 20 VA) made of SS 304 for clamping the cable/flat conductor to the rod. Impact point (219 20 IP) on the bottom rod for easy insertion.

Earth enhancing mineral compound (ECS PB 12.5) is used for improving the soil conductivity. Earth enhancing mineral compound shall be so designed and constructed that in normal use their performance is reliable and without danger to persons and the surroundings. The material shall be mineral inert to sub soil and shall not pollute the environment. It shall provide a stable environment in terms of physical and chemical properties and exhibit low resistivity. It shall not be corrosive to the earth electrode itself. The material should have a resistivity less than 50 Ohm meter. It should be free from hazardous substances The mineral compound is required to have minimum 12.5 Kg of the total composite.

FRP (UFE FRP)Earth electrode inspection chamber with heavy duty cover should be used to cover the Earth Rod. The dimension shall be 250mmx 250mmx 250mm with a weight bearing capacity of 15KN. The earth resistance shall be less than 2 Ohms. Additional earth electrode shall be driven one over the other or using parallel earth electrodes to achieve the specified earth resistance value, if the soil resistivity is found high. For driven rod method the earth enhancing mineral compound has to filled at a depth of 0.6 meter from surface and excavating a manhole size of 0.275 meter length and breadth. For augering method the earth enhancing mineral compound has to be mixed with garden soil and filled in the entire length of rod.

### **8.1.6 Marking**

- i) Earth bars/terminals at all switch boards shall be marked permanently as **E**
- ii) Main earth terminal shall be marked **Safety Earth – Do Not Disconnect.**

## **9.0 CABLE TRAY SYSTEM**

### **9.1 SCOPE**

This covers the requirements of cable tray used for power cables and data cables.

GI Cable Cable Tray System shall be followed.

The rate quoted for the cable tray items shall be inclusive of all the accessories such as horizontal and vertical reducers, tees, cross members, MS threaded rod etc. Metallic cable tray shall be double earthed by using 25x6mm GI strip. The cable trays for communication cabling shall be double earthed by using 10SWG bare copper at both ends. Earthing jumpers (10SWG Cu) shall be provided at tray joints .

## **9.2 Ladder/Perforated GI Cable Tray**

### **i) Scope**

Supply, fabrication, painting and fixing of hot dip GI cable tray including horizontal and vertical reducers, tees, cross members and other accessories as required and duly suspended from the ceiling with MS threaded rod suspenders/ fixed in ceiling and painting etc as required.

The cable trays and supports shall meet the following Specifications:

1. Type - Hot dip galvanized preformed mild steel ladder type
2. Hot rolled plain sheets of tested quality ( D ) grade as per IS 1079.
3. Hot dip galvanized as per IS 2629/4759, Zinc-98 shall be as per IS 209
4. Thickness of Zinc Coating on hot dip galvanized items shall be 75 Microns.
5. Hot dip galvanized cable trays shall be conforming to IS 2629/2633/2759.
6. Side channel-15X50X25 MM
7. Thickness-2 MM
8. Rungs – 15X15X30X2 MM welded @250 MM c/c or bolted type.
9. Standard Length – 2500 MM

Cable trays shall be supported at every interval than 2.5m. Cable tray shall be Ready-made one and of reputed makes.

## **9.3 Un Perforated Cable tray**

### **Scope**

Supply, fabrication, painting and fixing of unperforated cable tray and cover for communication system including horizontal and vertical reducers, tees, cross members and other accessories as required and duly suspended from the ceiling with MS suspenders/ fixed in ceiling and painting etc as required. Unperforated Cable Trays and cover shall be designed and tested as per IEC 61537. Tray shall be fabricated using Galvanized Strip conforming to DIN E 12329 for Indoor closed and dry atmospheric application

The cable trays and supports shall meet the following Specifications:

- |           |   |  |
|-----------|---|--|
| 1. Type   | - | Galvanized Strip conforming to DIN E 12329 |
| 2. Length | - | 3m   |

- |   |   |                              |
|---|---|------------------------------|
| 3. Thickness                                      | - | 100MM wide with 0.6mm thick  |
|   | - | 200MM wide with 0.7mm thick  |
|   | - | 300MM wide with 0.9mm thick  |
| 4. Wall support with welded head plate 40mm       | - | 100MM wide with 110mmx 50mmx |
| 50mmx40mm   | - | 200MM wide with 210mmx       |
| 310mmx65mmx40mm                                   | - | 300MM wide with              |
| 5 Weight Bearing Capacity (@1.5mtr span distance) | - | 100MM wide with 75Kg/mtr     |
|   | - | 200MM wide with 80Kg/mtr     |
|   | - | 300MM wide with 100Kg/mtr    |
| 6. Thickness of cable tray cover                  | - | 0.6mm                        |
| 7. Truss head screw with nut and washer           | - | M6 x 20 mm, M6 X 30 mm       |

#### **9.4 PVC Flame Proof under floor ducts**

The Underfloor Junction box shall be designed and Manufactured for the screed covered installation system with pre punched knockouts suitable for 60 x 25 mm and 90 x 35 mm Trapezoidal duct entries. The Box has to supplied along with the screed protection cover which can also be used for self height adjustment of the Junction with respect to the floor level according to the site condition. The Junction and service outlet frame shall be made of Polyamide suitable for tile application with a 4 mm thick GI load plate on the top and with a recess of 5 mm to fix the same floor covering on the top. The duct opening (cable exit points inside the box) has to be sealed with suitable fire sealant according to National electrical code or BIS.

#### **9.5 MS Items**

##### **i) Scope**

Supply, fabrication, painting and fixing of M.S items such as Flat / Tees / Angles / Channels etc. required for the cable bay/conduit tray and necessary civil works such as grouting, finishing etc.

Scope covers supply of all anchor fasteners, anchor bolts and all connected civil works such as cutting holes on wall, making good the same.

##### **ii) Material**

The steel sections used should be of good quality, manufactured by reputed companies. Steel sections of reputed manufacturers (like SAIL, Vaizag steel etc) shall be used. If smaller sections of these makes are not available, re-

rolled steels of reputed make shall be used. In any case the make of steel should be got approved from engineer in charge before its supply.

## **9.6 SPECIFICATION FOR PAINTING**

### **9.6.1 SCOPE**

This section covers the requirements of painting work in internal electrical installations, carried out manually by brush. This does not cover spray painting work of factory made items.

### **9.6.2 PAINTS**

Paints, oils, vanishes etc. of approved make, in original tin to the satisfaction of the Engineer-In-Charge shall only be use.

### **9.6.3 PREPRATION OF THE SURFACE**

The surface shall be thoroughly cleaned and made free from dust or foreign matter before painting is started. The proposed surface may be inspected by the Engineer-In-Charge before the paint is applied.

### **9.6.4 APPLICATION:**

- i) Paint shall be applied with brush. The paint shall be spread as smooth and even as possible. Particular care shall be paid to rivets, nuts, bolts and overlapping. Before drawing out in small containers, it shall be continuously stirred with a smooth stick, while painting work is taken up.
- ii) Primary coat of anti-corrosive paint shall be given in the case of steel work, after preparation the surface. In all cases of painting work, finishing shall be with 2 coats of paint in approved shade.
- iii) Each coat shall be allowed to dry out sufficiently before a subsequent coat is applied.

### **9.6.5 PRECAUTIONS**

All furniture, fixture, glazing, floors etc. shall be protected by suitable covering. All stains, smears splashing, dropping etc. shall be removed. While painting of wiring etc. it shall be ensured that the painting of wall and ceiling etc. is not spoiled in any way.

## **10.0 INSTALLATION**

### **Scope**

The intent of this specification is to define the requirements for the installation, testing and commissioning of the electrical items mentioned in the schedule of requirements. The work shall, however at all times carried out strictly as per the instructions of the Engineer-in-Charge.

The Contractor shall furnish all tools, welding equipment, rigging materials, testing equipment, test connections and kits etc. Required for complete installation, testing and commissioning of the items included in the Contract.

The Contractor shall carry out touch-up painting on any equipment indicated by the Engineer-in-Charge, if the finish paint on the equipment is soiled or marred during installation handling.

The interconnecting control cables between LT panel boards, Synchronisation panel, Battery charger, DG sets, 230V auxillary power supply etc. should be done by the contractor as required.

The installation shall conform in all respects with Indian Standard Code of Practice and Kerala state Elecrical inspectorate rules.

### **10.1 Diesel Generator set**

Contractor has to mount the engine with alternator on the base plate and align and assemble the set. Suitable anti-vibration mountings as approved for the complete set shall be provided. Coupling (both halves) with guards shall be provided. Contractor shall provide insulated exhaust piping for each set. The acoustic should be designed to reduce the noise level to around 70 dB measured 1m from DG set Acoustic enclosure. There should be hood on top of the exhaust pipe and the work should be as per pollution Control board and other statutory authorities specification.

All accessories like cooling system, fuel line, exhaust line, ACBs, Interconnecting piping, supports, control wiring cable etc. should be done by the contractor as per standards.

All checks and tests as per the Manufacturer's drawings/manuals, relevant code of installation shall be carried out by the Contractor as part of the installation work.

### **10.2 LT Panel Boards**

Switchgears shall be installed in accordance with specified code of practice and the Consultants instructions. The panels shall be delivered in convenient shipping section by the contractors. The Contractor shall be responsible for final assembly and inter-connection of busbars/wiring. Foundation channel shall be grouted in the flooring by the Contractor. Switchgear panels shall be aligned and levelled on their base channels and bolted or tack welded to them as per the instructions of the Engineer-in-charge. The earth bus shall be made continuous throughout the length. Loosely supplied

relays and instruments shall be mounted and connected on the switchgear. Wherever the instruments and relays are supplied separately, they shall be mounted only after the associated control panel have been erected and aligned.

After erection the switchboard shall be inspected for dust and vermin proofness. Any hole, which might allow dust or vermin etc. to enter the panel, shall be plugged suitably at no extra cost.

If the instrument transformers are supplied separately they shall be erected as per the direction of the Engineer-in-charge. The Contractor shall fix the cable glands after drilling the bottom top plates of all switch boards with suitable holes at no extra cost.

Range of overload relays/timers etc. shall be checked with requirement of purchaser actually to be connected at site and if the same is under-sized/over-sized, it shall be brought to the notice of Engineer-in-charge and shall arrange procurement of correct rated components. However, the Contractor shall not charge anything extra for cost/labour for such replacements.

#### 10.2.1 Testing

The Contractor shall perform operating tests on all switchgear and panels to verify operation of switchgear/panels and correctness of the interconnections between various items of the equipment. This shall be done by applying normal ac or dc voltage to the circuits and operating the equipment for functional checking of all control circuits, eg. closing, tripping, control interlock, supervision and alarm circuits.

All connections in the switchgear shall be tested from point to point for possible grounds or short circuit.

All electrical equipment alarms shall be tested for proper operation by causing alarms to sound under simulated abnormal conditions.

The Contractor shall arrange testing and calibrations of relays. The testing equipment including primary and secondary injection sets (if required) etc. shall also have to be arranged by the Contractor. Payment for above work shall be deemed to have been included in the erection of switch boards/control panels.

Insulation resistance tests shall be carried out by following rating meggers:

- a) Control circuits upto 220 V : by 500 V Insulation tester
- b) Power circuits, busbars, connections Upto 11kV : by 1000V Insulation tester
- c) Power circuits, busbars, connections above 33kV : by 5000V motor operated insulation tester



Before electrical panel is energised, the insulation resistance of each bus shall be measured from phase to ground. Measurement shall be repeated with circuit breakers in operating positions and contact open. Before switchgear is energised, the insulation resistance of all DC control circuits shall be measured from line to ground.

The following tests shall be performed on all circuit breakers during erection:

- i) Contact alignment and wipe shall be checked and adjusted where necessary in accordance with the breakers manufacturer's instructions.
- ii) Each circuit breaker shall be closed manually and its insulation resistance measured from phase to phase and phase to ground before erection.
- iii) All adjustable direct acting trip devices shall be set using values given by the Engineer-in-charge/manufacturer.
- iv) The dielectric strength of insulating oil wherever applicable shall be checked

Before switchgear is energised the following tests shall be performed on each circuit breaker in its test position.

- i) Close and trip the circuit breaker from its local & remote control switch, push button or operating handle. Switchgear control bus may be energised to permit test operation of circuit breaker with AC closing with prior permission of the Engineer-in-charge.
- ii) Test operation of circuit breaker latch, check carriage limit switch if provided.
- iii) Test proper operation of lockout device in the closing circuit, wherever provided by simulating conditions, which would cause a lockout to occur.
- iv) Trip breaker either manually or by applying current or voltage to each of its associated protective relays.

Before switchgear is energised, the test covered above shall be repeated with each breaker in its normal operating position.

All electrical equipment alarms shall be tested for proper operation by causing alarms to sound under simulated abnormal conditions.

The Contractor shall arrange testing and calibrations of relays. The testing equipment including primary and secondary injection sets (if required) etc. shall also have to be arranged by the contractor. Payment for the above work shall be deemed to have been included in the erection of switch boards/control panels.

#### **Performa for Panels**

- a) Circuit (breaker or Supplier module designation/bus no.)

b) Insulation resistance tests (contacts open, breaker racked in position).

a) Between each phase of bus : Mega ohm

b) Between each phase and earth : Mega ohm

c) DC and AC control & auxiliary circuits : Mega ohm

d) Between each phase of CT/PT and  
CT & PT circuit if any : Mega ohm

c) CT checks:

i) CT ratio

ii) CT secondary resistance

iii) CT polarity check

d) Check for contact alignment and wipe.

e) Check/test all releases/relays.

f) Check mechanical interlocks.

g) Check switchgear/control panel wiring.

h) Check electrical interlocks.

i) Checking of breaker/control circuits for

i) Closing-local and remote (wherever applicable)

ii) Tripping-local and remote (wherever applicable)

j) Opening time of breaker/contactactor.

k) Closing time of breaker/contactactor.

(This Performa shall be jointly signed by the Engineer-in-charge and the Contractor.)

### 10.2.2 Completion tests

After supply and installation of complete project or a particular building/area, the contractor shall carry out following tests before switching on the power to installation and the results shall be recorded and submitted to the engineer-in-charge. If results are not satisfactory/as per the standard, the contractor shall identify the defects/short coming and shall rectify the same. Nothing extra

shall be paid for carrying out these tests and contractor has to arrange all necessary instruments.

#### 10.2.3 Insulation resistance to earth

This to be measured with all fuse links in place all switches on all lamps and appliance in position by applying a voltage not less than twice the working voltage (subject to a limit of 500V). Insulation resistance of the whole or any part of the installation to earth must not be less than 50 Megaohms divided by the number of outlets (points and switch positions) except that it need not exceed 1 Megaohm for the whole installation.

#### 10.2.4 Insulation resistance between conductors

Test to be made between all the conductors connected to one pole or phase conductor of the supply and all the conductors connected to the middle wire or neutral or the other pole or phase conductors of the supply. For this test, all lamps shall be removed and all switches put on. The result of the test must be 50 Megaohms divided by the number of outlets (point and switch positions) but need not exceed one Megaohm for the whole installation.

#### 10.2.5 Polarity of single pole switches

Test shall be made to verify that all non-linked single pole switches are on phase conductor (Live) and not on the neutral or earthed conductor.

#### 10.2.6 Resistance of metal conduits/sheaths (Earth continuity test)

In case of cables encased in metal conduit or metallic sheathing, the total resistance of the conduit or sheathing from the earthing point to any other position in the completed installation shall not exceed 2 ohms.

#### 10.2.7 Busbar chamber

Busbar chambers shall be installed on fixed type switch boards with GI bolts and nuts.

#### 10.2.8 Connections

- i) Connections to busbars shall be made either by clamping arrangement, or by bolts and nuts as required. Tapped holes with studs may be permitted only for copper busbars for tapping conductor size upto 16 sq.mm.
- ii) All connections shall be made such that there is a clear metal to metal area contact at the tappings so that the current density of the busbars at the point of connection does not exceed permissible limits, avoiding local heating.

- iii) For tap-off connections from busbars, PVC insulated wiring cables may be used for current capacity upto 100A. and for higher current capacities, solid conductors/strips suitably insulated with PVC sleeve/tape shall be used.
- iv) The bolts and nuts used for connections to busbars shall be of aluminium alloy, tinned forged brass or galvanised iron. Suitable precaution shall be taken against heating due to bi-metallic contact, spring washers and plate washers, shall be used with the studs/nuts to ensure proper contact pressure.

### **10.3 Cabling**

Cable network shall include power, control and lighting cables, which shall be laid in underground trenches, Hume pipes, open trenches, cable trays, GI pipes, or on building structure surfaces as detailed in the relevant drawings. Cable schedules or as per the Engineer-in-charge's instructions. Supply and installation of cable trays, GI pipes/conduits, cable glades sockets at both ends, isolators, junction boxes, remote push buttons stations, etc. shall be under the scope of the Contractor.

#### **10.3.1 General requirements for handling of cables**

- a) Before laying cables, these shall be tested for physical damage, continuity absence of cross phasing, insulation resistance to earth and between conductors. Insulation resistance tests shall be carried out with 500/1000 volt Megger.
- b) The cables shall be supplied at site, wound on wooden drum as far as possible. For smaller length and sizes, cables in properly coiled form can be accepted. The cables shall laid by mounting the drum of the cable on drum carriage. Where the carriage is not available, the drum shall be mounted on a properly supported axle, and the cable laid out from the top of the drum. In no case the cable will be rolled on, as it produces kinks which may damage the conductor.
- c) Sharp bending and kinking of cables shall be avoided. The bending radius for XLPE insulated and sheath armoured cable shall not be less than 12 D for LT cable and 15D for HT cable. Where 'D' is overall diameter of the cable.
- d) While drawing cables through GI pipes, conduits, RCC pipe, ensure that size of pipe is such that, after drawing cables, 40 % area is free. After drawing cable, the end of pipe shall be sealed with cotton/bituminous compound.
- e) High voltage (11 kV and above), medium voltage (230 V and above) and other control cables shall be separated from each other by adequate spacing or running through independent pipes/trays.

- f) Armoured cables shall never be concealed in walls/floors / roads without GI pipes, conduits RCC pipes.
- g) Joints in the cable throughout its length of laying shall be avoided as far as possible and if unavoidable, prior approval of site engineer shall be taken. If allowed, proper straight through epoxy resin type joint shall be made, without any additional cost.
- h) A minimum loop of 3 M shall be provided on both ends of the cable, or after every 50 M of unjointed length of cable and on both ends of straight through cable joint. This additional length shall be used for fresh termination in future. Cable for this loop shall be paid for supply and laying.
- i) Cable shall be neatly arranged in the trenches/trays in such a manner so that criss-crossing is avoided and final take off to the motor/switchgear is facilitated. Arrangement of cables within the trenches/trays shall be the responsibility of the Contractor.
- j) All cable routes shall be carefully measured and cable cut to the required lengths and undue wastage of cables to be avoided. The routes indicated in the drawings is indicative only and the same may be rechecked with the Engineer-in-charge before cutting of cables. While selecting cable routes, interference with structures, foundations, pipe line, future expansion of buildings, etc. should be avoided.
- k) All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation. For this purpose, ends of all PVC insulated cables shall be taped with an approved PVC or rubber insulating tape. Use of friction type or other fabric type tape is not permitted. Lead sheathed cables shall be plumbed with lead alloy.
- l) Wherever cable rises from underground/concrete trenches to motors/switchgears/push buttons, these shall be taken in GI pipes of suitable size, for mechanical protection upto 300 mm distance of concerned cable gland or as instructed by the Engineer-in-charge.
- m) Where cables pass through foundation/walls of other underground structures, the necessary ducts or openings will be provided in advance for the same. However, should it become necessary to cut holes in existing foundations or structures the electrical Contractor shall determine their location and obtain approval of the Engineer-in-charge before cutting is done.

### 10.3.2 Installation of Cables

Wherever cables are taken through masonry works and road crossings etc., they shall be protected by running through GI pipes and Hume pipes respectively. Depth shall be 1200 mm from top of finished road surface and it shall extend for about 1070 mm on both sides of the roads.

Utmost care shall be taken to avoid scratches, kinks and cuts on the conductor while transporting the cables to site or during installation. Suitable inhibiting grease shall be liberally applied to bare conductors, wherever they exist.

The junction boxes, cable end boxes etc. wherever required to be provided shall have sufficient wiring spaces with regard to the sizes of cables indicated in the drawings. Wherever required, the items to be supplied for electrification shall be complete with requisite type of cable glands, cable boxes, termination etc. and other accessories which are necessary for the satisfactory installation/operation of the installations as per relevant statutory rules and regulations.

Installation of all cables should be as per E.I. Standards. Fuses should be graded properly and should be selected based on the rating of cables. The cables shall be laid in trenches/overhead racks wherever available. The cables from cable trenches to the switcher shall be buried (as per standard practices and or taken through GI pipes to 1.2 m above ground/racks floor level. The cables taken over racks/ walls/ columns/ transformers shall be properly clamped using aluminium clamps of 16 SWG 1/4 hard or 3/4 hard sheet, the width varying from 12.5 to 25 mm at intervals of 750 mm. 225 mm minimum horizontal interaxial spacing shall be maintained when more than one cable is laid in same trench. Suitable and permanent type of cable markers is to be provided indicating the route and position of joints of cable. Loops should be provided at either ends of the cable. Identification tags should be provided for each cable in the trench at a distance of 3 metres.

Supply and installation of danger notice boards, where required, and other provisions under the statutory rules and regulations shall be included in the scope of this work.

The Contractor has to provide materials and carry out the wiring work including earthing according to IS 3043 unless otherwise specified and get it approved before using for work, by the authorised engineer of the Purchaser.

Sufficient number of earth pits shall be provided, if found necessary and inter-connected so as to have the resistance of the earthing installations not more than 0.5 ohm. In case the soil resistivity is found to be very high, a high sensitive relay may be used to co-relate the relay setting with high earth resistance.

The complete installation work shall be conforming to NEC-1985 and complying with the Indian Electricity Rules and to meet the approval of the State Electrical Inspector etc. Installation of all switch boards and distribution boards should be in conformity with Rule 51(1)(c) of I.E.R. 1956. MV installation should conform to I.S. 7732.

The cable terminations and earth terminations, wherever required, shall only be using compression type cable glands and suitable lugs.

All the materials to be supplied for this work shall be got approved by the concerned engineer at site.

The work will be considered complete only if the following tests are conducted, by the contractor at his own cost, satisfactorily in the presence of the site Engineer and are:

- a) Insulation test
- b) Earth resistance test and
- c) Continuity test

#### 10.3.3 Laying of Cables (underground system)

- a) Cables shall be so laid in ground that these will not interfere with other underground structures. All water pipes, sewage lines or other structures, which become exposed by excavation, shall be properly supported and protection from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded diverted as directed by the Purchaser.
- b) Cables shall be laid at minimum depth of 750 mm in case of LT & 1200 mm in case of HT, from ground level. Excavation will be generally in ordinary alluvial soil. The width of the trench shall be sufficient for laying of required number of cables.
- c) Sand bedding 75 mm thick shall be made below and above the cables. A layer of bricks (full size) shall be laid breadth wise, above sand bedding to cover cable completely. More than one cable can be laid in the same trench .However the relating location of cables in trench shall be maintained till termination. The surface of the ground after back filling the earth shall be made good so as to conform in all respects to the surrounded ground and to the entire satisfaction to the Engineer-in-charge.
- d) For all underground cables, route markers should be used.
  - i) Separate cable route markers should be used for LT, HT and telephone cables.
  - ii) Route markers should be grounded in ground with 1:2:4 cement concrete pedestal size as per SOQ.
  - iii) Cable markers should be installed at an interval not exceeding 50 M along the straight routes of cables at a distance of 0.5 M away from centre of cable with the arrow marked on the cable markers plate indicating the location of cable. Cable markers should also be used to identify change in direction of cable route and for location of every joint in underground cable.
- e) RCC hume pipes for crossing road in cable laying shall be provided by Contractor. RCC hume pipe at the ends shall be sealed by bituminous compound after laying and testing of cable by electrical Contractor without any extra charge.

#### 10.3.4 Laying of Cables under Floors

- a) GI class A pipe shall be used for laying of outgoing cables from distribution boards to various equipment. Preferably one cable shall be drawn through one pipe. Size of pipe shall be such that after drawing of cable 40 % area is free. If length of pipe is more than 30 M, free area may be increased to 50 %.
- b) Use of elbows is not allowed at all and number of bends shall be kept minimum. Instead of using bends with sockets, pipe bending machine shall be used for making long smooth bends at site.
- c) Ends of pipe shall be sealed temporarily while laying with cotton/jute/rubber stopper etc. to avoid entry of building material.
- d) Exact locations of equipment shall be ascertain prior to laying of pipe.

#### 10.3.5 Laying of Cable in Masonry Trenches

- a) Masonry/concrete trenches of laying of cable shall be provided by Contractor. However steel members such as MS angles/flats etc. shall be provided & grouted by electrical Contractor to support the cables. Cables shall be clamped to these supports with aluminium saddles/damps. More than one tier of cables can be provided in the same trench if the number of cables is more.
- b) Entry of cables in trenches shall be sealed with bituminous MASTIC compound to stop entry of water in trenches.

#### 10.3.6 Laying of Cables in Cable Racks

Cable Racks to be used for cables laid indoors except for single cables. The cable racks shall be of ladder type fabricated out of structural steel, MS, GI or aluminium perforated as indicated. The cable racks shall be of adequate strength to carry the weight of cables with out sagging. Structural bracket grouted in the build up trenches to support the cable such supports shall be at intervals of not less than 750 mm centres. All the structural steel work shall be finished with two coats of paint over primer.

- a) Cables shall be fixed in cable trays in single tier formation and shall be clamped with aluminium flat clamps and galvanised bolts/unit.
- b) Earthing flat/wire can also be laid in cable tray along with cables.
- c) After laying of cables minimum 20 % area shall be spare.

#### 10.3.7 Laying of Cables on Building Surface/Structure



- a) Such type of cable laying shall be avoided as far as possible and will be allowed only for individual cables or small group of cables which run along structure.
- b) Cables shall be rigidly supported on structural steel/masonry using individual cast/malleable iron galvanised saddles and these supports shall be approximately 400 to 500 mm for cables upto 25 mm overall diameter and maximum 1000 mm for cables larger than 25 mm. Unsightly sagging of cables shall be prevented. Only aluminium/GI clamps with GI bolts/nuts shall be used.
- c) If drilling of steel structure must be resorted to, approval must be secured from the Engineer-in-charge and steel must be drilled where the minimum weakening of the structure will result.

#### 10.3.8 Termination and Jointing of Cables

- a) Use of Glands

All PVC cable upto 1.1 kV grade, armoured or unarmoured shall be terminated at the equipment/junction box/ isolators/push buttons/control accessories, etc. by means of suitable size compression type cable glands armour of cable shall be connected to earth point. The Contractor shall drill holes for fixing glands wherever necessary. Wherever threaded cable gland is to be screwed into threaded opening of different size, suitable galvanised threaded reducing bushing shall be used for approved type.

In case of termination of cables at the bottom of the panel over a cable trench having no access from the bottom, a close fit holes should be drilled in the bottom plate for all the cables in one line, then bottom plate should be split in two parts along the centre line of holes. After installation of bottom plate and cables with glands, it shall be sealed with cold sealing compound.

- b) Use of Lugs/sockets

All cable leads shall be terminated at the equipment terminals, by means of crimped type solder less connectors unless the terminals at the equipment ends are suitable for direct jointing without lugs/sockets.

The following is the recommended procedure for crimped joints and the same shall be followed:

- i) Strip off the insulation of the cable end with every precaution, not to sever or damage any strand. All insulation to be removed from the stripped portion of the conductor and ends of the insulation should be clean and square.

- ii) The cable should be kept clean as far as possible before assembling it with the terminal/socket. For preventing the ingress of moisture and possibility of re-oxidation after crimping of the aluminium conductors, the socket should be fitted with corrosion inhibiting compound. This compound should also be applied over the stripped portion of the conductor and the palm surface of socket.
- iii) Correct size and type of socket/ferrule/lug should be selected depending on size of conductor and type of connection to be made.
- iv) Make the crimped joint by suitable crimping tool.
- v) If after crimping the conductor in socket/lug, same portion of the conductor remains without insulation the same should be covered sufficiently with PVC tape.

c) Dressing of Cable inside the Equipment

After fixing of cable glands, the individual cores of cable shall be dressed and taken along the cableways (if provided) or shall be fixed to the panels with polyethylene straps. Cable shall be dressed in such a manner that small loop of each core is available inside the panel.

For motors of 20 HP and above, terminal box if found not suitable for proper dressing of an aluminium cables, the Contractor shall modify the same without any additional cost.

Cables inside the equipment shall be measured and paid for.

d) Identification of Cables/Wires/Cores

Power cables shall be identified with red, yellow & blue PVC tapes for trip circuits identification, additional red ferrules shall be used only in the particular cores of control cable at the termination points in the switchgear/control panels and control switches.

In case of control cables all cores shall be identified at both ends by their wire numbers by means of PVC ferrules or self sticking cable markers, wire numbers shall be as per schematic/connection drawing. For power circuit also wire numbers shall be provided if required as per the drawings of switchgear manufacturer.

### 10.3.9 Testing of Cables

- a) Before energising, the insulation resistance of every circuit shall be measured from phase to phase and from phase to ground. This requires 3 measurements if one side is grounded and 6 measurements for 3 phase circuits.

- b) Where splices or terminations are required in circuits rated above 650 volts, measure insulation resistance of each length of cable before splicing and/or terminating. Report measurements after splices and/or terminations are complete.
- c) DC High Voltage test shall be made after installation on the following:
  - i) All 1100 Volts grade cables in which straight through joints have been made.
  - ii) All cables above 1100 V grade.

For record purposes test data shall include the measured values of leakage current versus time.

The DC High Voltage test shall be performed as detailed below:

Cables shall be installed in final position with the entire straight through joints complete. Terminations shall be kept unfinished so that motors, switchgear, transformer etc. are not subjected to test voltage.

The test voltage and duration shall be as per relevant codes and practices of Indian Standards Institution.

### 10.3.10 Proforma for Testing Cables

#### Proforma - A

Date of Test

- a) Drum No. from which cable taken
- b) Cable from                      to
- c) Length of run of this cable                      metre
- d) Insulation resistance test :

Voltage of Megger                      ..... Volts

- i) between core-1 to earth..... Megaohm
- ii) between core-2 to earth..... Megaohm
- iii) between core-3 to earth..... Megaohm
- iv) between core-1 to core-2..... Megaohm
- v) between core-2 to core-3..... Megaohm
- vi) between core-3 to core-1..... Megaohm

- e) Highvoltage test                      Voltage                      Duration

- i) between cores and earth
- ii) between individual cores

Signature of  
Engineer-in-Charge

Signature of  
Contractor

**Proforma - B**

Cable Laying

(To be shown for each cable separately, voltage wise)

Date(s) of Test:.....

Voltage of Megger used:.....

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Continuity of cores	IR value (mega ohm)
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Before laying	Before back filling
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Between value	Between Value
---------------	---------------

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1) From.....To.....PVC/XLPE.....x.....sq.mm  
LV/MV/HV cable.....m in length.

R-N	R-N
Y-N	Y-N
B-N	B-N
R-Y	R-Y
B-R	B-R
Y-B	Y-B
R-E	R-E
Y-E	Y-E
B-E	B-E

Signature of  
Engineer-in-Charge

Signature of  
Contractor

**Proforma - C**

**Cable Jointing**

(To be shown for each cable separately, voltage wise)

Date(s) of Test:.....

Voltage of Megger used:.....

1      2      3

Number of Joint

Location

Type of cable(s)

Type of joint (Indoor/Outdoor, straight through/termination, LV/MV/HV)

Insulation resistance (Mega ohm) before jointing

Cable I -	(a) Between	R & Y
		Y & B
		B & R
	(b) Between	R & N
		Y & N
		B & N
	(c) Between	R & E
		Y & E
		B & E
Cable II -	(a) Between	R & Y
		Y & B
		B & R
	(b) Between	R & N
		Y & N
		B & N
	(c) Between	R & E
		Y & E
		B & E
	(c) Between	N & E

Insulation resistance (Mega ohm) of Jointed cable

Cable I -	(a) Between	R & Y
		Y & B
		B & R
	(b) Between	R & N
		Y & N
		B & N
	(c) Between	R & E

Y & E  
B & E  
N & E

Signature of  
Engineer-in-Charge

Signature of  
Contractor

### Proforma - D

Testing Before Commissioning

(a) Cable Work

Date(s) of Test:.....

(i) Details of high Voltage test conducted

System of supply.....

Test Voltage applied.....kV.....Minutes

Result of test-Satisfactory/Unsatisfactory.

Voltage of Megger used:-

Result of Megger testing:-

Between	R & Y
	Y & B
	B & R
Between	R & N
	Y & N
	B & N
Between	R & E
	Y & E
	B & E
	N & E

b) FEEDER PILLAR:-

i) Pillar Number:

ii) Voltage of megger used:

iii) Result of megger testing:

## 10.4 Wiring

### 10.4.1 Installation of non metallic Conduit

The erection of conduits of each circuit shall be completed before the cables are drawn in. All joints shall be sealed/cemented with approved cement. Damaged conduit pipes/fittings shall not be used in the work. Cut ends of conduit pipes shall have neither sharp edges nor any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes. The Engineer-in-charge, with a view to ensuring that the above provision has

been carried out, may require that the separate lengths of conduit etc. after they have been prepared shall be submitted for inspection before being fixed. All bends in the system may be formed either by bending the pipes by an approved method of heating, or by inserting suitable accessories such as bends, elbows or similar fittings, or by fixing non-metallic inspection boxes, whichever is most suitable. Where necessary, solid type fittings shall be used. Radius of bends in conduit pipes shall not be less than 7.5 cm. No length of conduit shall have more than the equivalent of four quarter bends from outlet to outlet. Care shall be taken while bending the pipes to ensure that the conduit pipe is not injured, and that the internal diameter is not effectively reduced.

All switches, plugs, fan regulators etc. shall be fitted in flush pattern. The fan regulators can be mounted on the switch box covers, if so stipulated in the tender specifications, or if so directed by the Engineer-in-Charge. After installation, all accessible surfaces of metallic accessories shall be painted. Conduit pipes shall be fixed by heavy gauge non-metallic saddles with base, secured to suitable approved plugs with screws in an approved manner, at an interval of not more than 60 cm, but on either side of couplers or bends or similar fittings, saddles shall be fixed at a closer distance from the centre of such fittings. Slotted PVC saddles may also be used where the PVC pipe can be pushed in through the slots.

Where the conduit pipes are to be laid along the trusses, steel joists etc. the same shall be secured by means of saddles or girder clips as required by the Engineer-in-Charge. Where it is not possible to use these for fixing, suitable clamps with bolts and nuts shall be used. If the conduit pipes are liable to mechanical damage, they shall be adequately protected.

The chase in the wall shall be neatly made and of ample dimensions to permit the conduit to be fixed in the manner desired. In the case of buildings under construction, the conduits shall be buried in the wall before plastering, and shall be finished neatly after erection of conduit. In case of exposed brick / rubber masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work. The conduit pipe shall be fixed by means of staples, J-hooks, or by means of saddles, not more than 60 cm apart or by any other approved means of fixing. All threaded joints of conduit pipes shall be treated with some approved preservative compound to secure protection against rust.

The conduit pipes shall be laid in position and fixed to the steel reinforcement bars by steel binding wires before the concreting is done. The conduit pipes shall be fixed firmly to the steel reinforcement bars to avoid their dislocation during pouring of cement concrete and subsequent tamping of the same. Fixing of standard bends or elbows shall be avoided as far as practicable, and all curves shall be maintained by bending the conduit pipe itself with a long radius, which will permit easy drawing in of conductors. Location of inspection / junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes. Suitable inspection boxes to the minimum requirement shall be



provided to permit inspection and to facilitate replacement of wires, if necessary. These shall be mounted flush with the wall or ceiling concrete. Minimum 65mm depth junction boxes shall be used in roof slabs and the depth of the boxes in other places shall be as per IS: 2667-1988. Suitable ventilating holes shall be provided in the inspection box covers.

#### **10.4.2 Fixing switch boxes and accessories.**

Switch boxes shall be mounted flush with the wall. All outlets such as switches, socket outlets etc. shall be flush mounting type, unless otherwise specified in the Additional Specifications. To facilitate subsequent drawing of wires in the conduit, GI fish wire of 1.6mm/1.2mm (16/18 SWG) shall be provided along with the laying of the recessed conduit. Cables carrying Direct Current may, if desired, be bunched whatever their polarity, but cables carrying alternating current, if installed in metal conduit shall always be bunched so that the outgoing and return cables are drawn into the same conduit. Where the distribution is for single phase loads only, conductors for these phases shall be drawn in one conduit. In case of three phase loads, separate conduits shall be run from the distribution boards to the load points, or outlets as the case may be. The conduit pipe shall be fixed by means of staples, or by means of non-metallic saddles, placed at not more than 60 cm apart, or shall be fixed by any other approved means of fixing. At either side of the bends, saddles/staples shall be fixed at a distance of 15 cm from the centre of the bends.

#### **10.4.3 Installation of Lighting Fixtures**

Scope of work under this item shall start from light point, i.e. from the ceiling rose or metal box whichever is applicable with a ceiling rose, 3 runs of 1.5 Sq.mm PVC insulated copper wires/3 core 2.5 Sq.mm PVC insulated copper wires from this connector to the connector inside the lighting fixture, connections, fixing of lighting fixture complete with all accessories, lamps on wall/roof/steel truss, etc. testing the lighting fixture and commissioning. Contractor shall clarify from Engineer-in-charge for type of installation (direct on ceiling/hanging) of lighting fixture, if not specifically mentioned on drawings. Length of the suspension rods/angle/chain shall also be decided in consultation with the Engineer-in-charge. The suspension rods/angle/chain/clamps/ hook etc used for fixing the light fixtures shall be metallic type and it shall be with stand the weight of the light fixtures. While fixing the light fixtures in false ceiling, special care shall be taken to avoid damage of the false ceiling. The rate quoted for the installation of light fixtures shall be inclusive all the materials like suspension rods/angle/chain/clamps/ hook, loop wires etc and nothing shall be paid extra. Flexible metallic conduit shall be considered for taking the wires from main conduit to individual light fixtures (above false ceiling).

#### **10.7.4 Installation of Exhaust fan**

Scope of work under this item shall start from the ceiling rose of exhaust fan point, with 3 runs of 1.5 Sq mm PVC insulated copper wire from ceiling rose to connector of exhaust fan ,connections, including fixing of exhaust fan complete with accessories and louvers on walls with hold-fasts, testing the exhaust fans and commissioning.

#### **Special notes**

- a) Location of lighting fixtures/fans shall be shown on the working drawings and the same shall be followed. However, if due to site conditions the location cannot be adhered to, the same shall be brought out to the notice of the Engineer-in-charge for advice.
- b) Maintenance and custody of light fixture/fans after installation/ commissioning would be with contractor till that building/area is completed and handed over to Purchaser / Engineer-in-charge in satisfactory working order.  
The following types of fixtures are to be considered for the areas mentioned below.

### **11.0 MEASUREMENT**

#### **11.1 Quantities**

The quantities set out in the Schedule of Requirements are the estimated quantities of the work, but they are not to be taken as the actual and exact quantities of the Work to be executed by the Contractor in fulfillment of his obligations under the Contract.

#### **11.2 Works to be Measured**

The Consultant/Client shall, except as otherwise stated, ascertain and determine by measurement the value in terms of the Contract of work done in accordance with the Contract. He shall, when he required any part or parts of the Work to be measured, give notice to the Contractor's authorised agent or representative, who shall forthwith attend or send a qualified agent to assist the Engineer in making such measurement, and shall furnish all particulars required by either of them. Should the Contractor not attend, or neglect or omit to send such agent, then the measurement made by the Engineer or agent approved by him shall be taken to be the correct measurement of the work. For the purpose of measuring such permanent work as is to be measured by records and drawings, the Consultant shall prepare records and drawing month by month of such work and the Contractor, as and when called upon to do so in writing, shall, within fourteen days, attend to examine and agree such records and drawings with the Consultant and shall sign the same when so agree such records and drawings, they shall be taken to be correct. If, after examination of such records and drawings the Contractor does not agree the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor shall, within fourteen days of such

examination, lodge with the Consultant, for decision by the Consultant, notice in writing of the respects in which such records and drawing are claimed by him to be incorrect.

### **11.3 Mode of Measurement**

The Works shall be measured net, as prescribed in the specification of work, notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the Contract. Wherever not specifically mentioned in the Contract, the mode of measurement as prescribed in the relevant IS codes shall be applicable and binding to the Contract. Only the latest editions of all the codes of practices including all latest official amendments and revisions shall be applicable

### **11.4 Battery Limit**

Scope of work includes:

1. Supply and installation testing & commissioning of DG sets, LT Cables, LT Panel Boards, earthing system, lightning protection, wiring system, UPS system, light fixtures etc.
2. Cable laying, termination at both ends, testing & commissioning of LT cables from all LT Panels (Main Switch Board, Sub Switch Board, Capacitor Panel, Distribution Boards etc.)
3. Cable laying in buried route/trenches/trays as per specification, termination at both ends, testing and commissioning of LT power and control/instrumentation cables, cables between Switch boards and sub switch boards, between battery charger & DC switch board and various equipments in the building.
4. The scope of this contract includes supply, installation and termination on both sides of all control/instrumentation cables, its supports, etc.
5. Earthing system includes supply, installation and testing of earth pits and relevant earth conductors as per specification for, DG, RMU's, MSB, SSBs, MCB DBs etc.
6. Wherever buried cables are envisaged, scope of work includes digging of earth along the cable route, filling up of sand protective covering as per specification, laying of cable, covering the cables with sand bricks, back filling of earth etc., as per specification. Installation of Hume pipes including excavation, erection, back filling etc. Cable markers shall be supplied & installed as per specification.
7. Civil work includes grouting of equipment, complete supply & erection of LT panel boards, fixing of cable trays, pipes with all necessary supports.

8. In addition to the electrical erection the contractor shall provide the electrical danger boards, shock treatment charts, etc. on all the panel boards and other places where it is required.
9. The rates quoted for installation should include the charges for painting the conduits & supports as directed by Client/Consultant
10. **Liaison with all statutory authorities for getting sanction/approval/safety certificate/ power connection including submission of necessary forms to KSEB/ Electrical inspectorate as required is included in the scope of this work. Necessary fee for the same shall be reimbursed by Client/Consultant based on the production of actual bills.**

## 12.0 ABBREVIATIONS

ACB	Air Circuit Breaker
AC	Alternating Current
AIS	Air Insulated Switchgear
AMF	Auto Mains Failure
APFC	Automatic Power Factor Control
AVR	Automatic Voltage Regulator
CB	Circuit Breaker
CFL	Compact Fluorescent Lamp
COS	Change Over Switch
CT	Current Transformer
CSS	Compact Substation
DB	Distribution Board
DC	Direct Current
DCDB	Direct Current Distribution Board
DOL	Direct On Line
ELCB	Earth Leakage Circuit Breaker
ELR	Earth Leakage Relay
GCP	Generator Control Panel
GI	Galvanised Iron
IR	Insulation Resistance
kV	kilo Volt
kVA	kilo Volt Ampere
kVAr	kilo Volt Ampere reactive
kW	kilo Watt
kWh	kilo Watt hour
LDB	Lighting Distribution Board
LED	Light Emitting Diode
HT	HighTension
LT	Low Tension
LV	Low Voltage
MCB	Miniature Circuit Breaker
MCC	Motor Control Centre
MCCB	Moulded Case Circuit Breaker
MSB	Main Switch Board
MVA	Mega Volt Ampere
MW	Mega Watt
PDB	Power Distribution Board
PF	Power Factor
PI	Polarization Index
PLC	Programmable Logic Control
PT	Potential Transformer
PVC	Poly Vinyl Chloride
RCCB	Residual Current Circuit Breaker
REF	Restricted Earth Fault
RTD	Resistance Temperature Device

SDF	Switch Disconnecter Fuse
SLD	Single Line Diagram
SSB	Sub Switch Board
THD	Total Harmonic Distortion
TOD	Time of Day
UG	Under Ground
UPS	Uninterrupted Power Supply
VA	Volt Ampere
VT	Voltage Transformer
VCB	Vacuum Circuit Breaker
VFD	Variable Frequency Drive
VSD	Variable Speed Drive
WTI	Winding Temperature Indicator
XLPE	Cross Linked Poly Ethylene

#### LIST OF APPROVED MAKES

Sl.No	Item	Make of Materials/Equipment	Category
1	Diesel Engine	Cummins, Volvo, Mitsubishi, Kirloskar, MTU, Kohler	Category 1
2	Alternator	Stamford, Leroysoner, Crompton Greaves, kirloskar	Category 1
3	1.1 kV grade XLPE insulated PVC sheathed Al./ Cu. Cable	CCI, NICCO, KEI, Polycab, Universal, Havells, Gloster, Finolex, Traco, Bonton, Apar, RPG	Category 1
4	MCCB/ACB	Siemens, Schnieder, L&T , ABB, Legrand(for load banks), HPL	Category 2
5	Capacitor Banks	L&T, Sprague, ABB, Shreem, Epcos, Schnieder	Category 1
6	Starters, Timer & Contactors	Siemens, L&T, Schneider, C&S. ABB, BCH.	Category 3
7	SDFU, Isolator, SFCOS	L&T, Siemens, Schnieder, ABB	Category 2
8	Push Buttons	Tecnic, Schneider, Siemens, BCH, C&S, L & T	Category 4
9	LT Panels	CPRI/ERDA certified panel manufacturer with components of approved makes.	Category 1
10	Digital meters	L&T, ABB, Siemens, Schneider, Socomec, Secure	Category 3
11	APFC relay	ABB, Beluk, Epcos	Category 2
12	Indicating lamps (LED type)	Tecnic, Schneider, Siemens, BCH, C&S, L & T	Category 3
13	Fuses/Fuse carriers	Siemens, L & T, Schnieder, ABB.	Category 2
14	Relays	Siemens, L&T, ABB, GE, Schneider, Alstom, C&S	Category 2

15	Indicating meters(analog)	AE, MECO, L&T, Rishab, Toyo	Category 3
16	Instrument Transformer	AE, Intrans, Kappa, Intech, PGR Powertech, Kalpa	Category 3
17	Selector switches	L&T, C & S, Siemens, Schnieder, BCH, Teknic, Kaycee	Category 4
18	660/1100 volt grade stranded unsheathed wire with copper conductor	Finolex, RR Kabel, Lapp Kabel, Polycab, KEI	Category 2
19	Cable glands, lugs, End termination kits	Lapp Kabel, Gripwel, HMI, Denson, Multipressings, Yamuna Gasses, Dowels, Raychem, 3M	Category 3
20	Battery Charger	Amara Raja, Waves Electronics, HBL, Dubas	Category 3
21	TOD meter	L&T, Schnieder, Secure	
22	Exhaust Fans	Almonard, Crompton, polar, Khaitan, Baliga	Category 2
23	SMF/VRLA Batteries	Exide, Amara Raja, HBL	Category 3
24	Light Fittings	Philips, Wipro, K- lite, Crompton Greaves, Osram, Lighting Technologies, Bajaj	Category 3
25	LED Street light	Philips, Schreder, Crompton Greaves, Osram, Wipro, Lighting Technologies, Bajaj	Category 3
26	LED light fixtures	Philips, Osram, Crompton greaves, Wipro, Lighting Technologies, Bajaj	Category 3
27	LED Chip	CREE, Philips, Osram, Nichia	Category 3
28	Modular type switches, sockets, bell push, fan regulator etc.	Crab Tree(Athena), MK India (Blenz), Legrand(myris), Wipro (Northwest), Kolors (krest), ABB(Cheiron), Schneider	Category 3
29	Ceiling fan	Crompton Greaves, Polar, Usha, Khaithan, Kulirma, Orient	Category 3
30	Metalclad plug/socket/Decontactor	Legrand, C&S, Schnieder, Hagger,	Category 3
31	Industrial plug/socket/Decontactor	Legrand, Mennekes, Scame, ABB	Category 3
32	Thermoplastic industrial type plug/ socket / decontactor	Hensel, MK, CAPE, Mennekes	Category 3
33	MCB, RCBO,RCCB	Legrand, Siemes, L&T, Hagger, Schnieder,ABB, Mitsubishi	Category 2
34	MCB Distribution Boards	Legrand, Siemes, L&T, Hagger, Schnieder,ABB, Mitsubishi	Category 2
35	Chemical earthing	OBO, Dehn, CAPE, Excel	Category 4
36	GI conduit/M S Conduit	Any ISI marked.	Category 4
37	Ceiling Rose	Anchor, GM	Category 4
38	PVC Conduit and accessories/ casing and capping	Precision , Clipsal, Lappkabel, Balco	Category 3

39	Exhaust fans	Almonard, Crompton, Khaitan, Usha	Category 2
40	GI Cable tray	Indiana / Venus / Steelite / Rico Steel / Profab Engg	Category 3
41	Sandwich Bus duct	GE, L&T, Godrej, Schneider, C&S, Legrand, Alfaduct, EAE	Category 2
42	External Light	K-lite, Crompton, Philips, Wipro	Category 1

## **CATEGORY REQUIREMENT OF TEST CERTIFICATE / INSPECTION**

### **CATEGORY - 1:**

- a) Type test certificate for similar item done if not, one of the items offered to be type tested.
- b) OEMs routine test certificate.
- c) Acceptance test to be conducted in the presence of CLIENT/CONSULTANT representative at OEMs factory.

### **CATEGORY - 2:**

- a) Type test certificate for similar item done if not, one of the items offered to be type tested.
- b) OEMs routine test certificate.
- c) Visual and functional check by CLIENT/CONSULTANT official at site.

### **CATEGORY - 3:**

- a) OEM / Dealer/ Contractor routine test certificate.
- b) Visual and functional check by CLIENT/CONSULTANT official at site.

### **CATEGORY - 4:**

- a) Visual and functional check by CLIENT/CONSULTANT official at site.



#### **4. FORMS OF DIFFERENT DEEDS**

##### **INSTRUCTIONS FOR FILLING THE TENDER FORM**

1. In this tender item specifications are given in the following sections:

**A. TECHNICAL SPECIFICATIONS**

**B. SCHEDULE OF QUANTITIES WITH RATES  
with Unit Rate Specifications**

Technical specifications are the general instructions for carrying out the works.

Unit rate specifications are the descriptions of items for which unit rates are to be worked out by the bidder by considering all tender information.

2. The Contractor has to work out his rate as an overall percentage above or below or at the rate given in the schedule by a single entry. The contractor's over all percentage shall be worked out based on the unit rate specification and rates provided against each specification.

The rate has to be entered by a single entry in front of the schedule both in words and in figures.

3. The Contractors should certify that he has studied the works at site and acquainted himself with the position with regard to constructions, materials and labour required for the work.

4. Every Contractor should furnish along with his tender, documents to prove their annual turnover and latest acknowledged income-tax return submitted to the income tax department.

5. Experience in similar works have to be established by means of completion certificates from Clients.

6. The Contractors are to pay the earnest money deposit as specified in the tender notice along with the tender. Tenders for which earnest money deposit has not been received shall be rejected. There shall be no exemption for any tenderer from submitting the earnest money deposit.

7. Certified copies of Registration Certificate, Partnership Deed and Power of Attorney or Articles of Association in case of Limited companies will have to be furnished for considering the acceptance of the tender.

8. The tender of the Contractor not complying with the above instructions may be rejected.

9. The tenderer should return the original tender document after putting the signature on all pages.

10. The Contractor shall be responsible for furnishing the necessary forms including Form No.8-C, 20, 20-A, 20-B, 20-D, 20-F, etc. applicable for deducting work contract tax under the Kerala Value Added Tax Act 2003.

**Tender No.....**

**TENDER FORM**

To  
The Superintending Engineer  
.....

Dear Sirs,

**Sub:** .....

With reference to the tender invited by you for the above purpose, I/We do hereby Tender for this after having:

- a) Examined the designs, details, specification, schedule of quantities, instructions to tenders, and the conditions of contract annexed thereto (hereinafter called the Contract Documents).
- b) Visited the site of work, studied the site conditions, nature of substrata, availability of construction materials and
- c) Acquired the requisite information on all prevailing factors affecting the tender.

I/We undersigned hereby offer to carry out the proposed work in strict accordance with the Contract documents for the consideration to be calculated in terms of the priced Schedule of Quantities.

I/We have noted that time is the essence of the contract and undertake to complete the whole of the works as per the attached schedule from the date of receipt of an intimation from you that our tender has been accepted and upon receiving possession of site. I/We further undertake that on failure, subject to the conditions of the contract relating to extension of time, I/We are willing to pay the agreed Liquidated Damages/Penalty for the period during which the work remains incomplete beyond the due date of completion.

I/We further agree to the deduction of performance security deposit and security deposit mentioned in NIT which will be returned to me/us as per the relevant clauses in the agreement. The deduction will be as explained in Notice Inviting Tender.

Further we undertake to execute the works which will be entrusted to us in the most workmanlike manner within the stipulated completion period. If our Tender is found acceptable, we agree to enter into a contract as specified by you within 15 days of the receipt of intimation of acceptance of our tender.

Our Bankers are:

1. ....
2. ....

Place :  
Date :

Signature of tenderer with Seal

Name of the partners of the firm

OR

Name of the person having power of Attorney to sign the contract.

**CONTRACT FORM**

(ON NON-JUDICIAL STAMP PAPER OF Rs.200/-)

THIS AGREEMENT made in ..... day of ..... 20... between .....  
(Name of Owner) of ..... (Address of Owner) (hereinafter called “the Owner”)  
of the one part and ..... (Name of Contractor) of .....  
(Address of Contractor) (hereinafter called “the Contractor”) of the other part:

WHEREAS the Owner invited bids for the execution of work viz., .....  
(Brief description of work) and had accepted a bid by the Contractor for the work in the sum of  
..... (Contract price in words and figures) (hereinafter called  
“the Contract Price”).

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents shall be deemed to form and be read and construed as part of this agreement, viz.:
  - a. the Tender Document No..... and the Price schedule submitted by the Contractor.
  - b. the Owner’s Letter of Acceptance.
3. In consideration of the payments to be made by the Owner to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Owner to complete the work and to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Owner hereby covenants to pay the Contractor in consideration of the execution of the works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

TOTAL CONTRACT PRICE:

TIME OF COMPLETION: .....

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

Signed, Sealed and Delivered by the

said ..... (for the Owner)

in the presence of: .....

Signed, Sealed and Delivered by the

said ..... (for the Contractor)

in the presence of .....

**FORM OF PERFORMANCE GUARANTEE/BANK GUARANTEE BOND**  
(On Non-Judicial Stamp Paper)

To  
Superintending Engineer,  
.....(ACCEPTING AUTHORITY)

In consideration of the.....(hereinafter called The ACCEPTING AUTHORITY ) having offered to accept the terms and conditions of the proposed agreement between ..... and ..... (hereinafter called “the said contractor(s)” for the work.....(hereinafter called “the said agreement”) having agreed to production of an irrevocable bank guarantee for Rs..... (Rupees..... Only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said contract.

1. We.....(indicate the name of Bank)(hereinafter referred to as the “Bank”) hereby undertake to pay to the Accepting Authority an amount not exceeding Rs.....(Rupees..... only) on demand by the Accepting Authority.

2. We.....(indicate the name of Bank) do hereby undertake to pay the amounts due and payable under this Guarantee without any demur, merely on a demand from the Accepting Authority stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs..... (Rupees..... only).

3. We, the said Bank, further undertake to pay the Accepting Authority any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the contractor(s) shall have no claim against us for making such payment.

4. We the said bank further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement, and it shall continue to be enforceable till all the dues of the Accepting Authority under or by virtue of the said agreement have been fully paid, and its claims satisfied or discharged, or till the Engineer-in-charge, on behalf of the Government, certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor(s), and accordingly discharges this guarantee.

5. We the said bank further agree with the Accepting Authority that the Accepting Authority shall have the fullest liberty without or consent, and without effecting in any manner our obligations hereunder, to vary any of the terms and conditions of the said agreement or to

extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Accepting Authority against the said contractor(s), and to forbear or enforce any of the terms and conditions relating to the said agreement, and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act of omission on the part of the Accepting Authority any indulgence by the Accepting Authority to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. The guarantee will not be discharged due to the change in the constitution of the Bank or the contractor(s).

7. We the said bank lastly undertake not to revoke this guarantee except with the previous consent of the Accepting Authority in writing.

8. The guarantee shall be valid up to .....unless extended on demand by the Accepting Authority. Notwithstanding anything mentioned above, our liability against this gurantee is restricted to Rs..... (Rupees..... Only), and unless a claim in writing is lodged with us within six months of the date of expiry or extended date of expiry of this guarantee all our liabilities under this Guarantee shall stand discharged.

Dated the..... Day of.....For.....;

In presence of:

WITNESS

1. For and on behalf of (The Bank)  
Signature .....  
Name & Designation .....  
.....
2. ....  
Authorisation No. ....  
Name & Place .....  
Bank's Seal .....

The above Guarantee is accepted by Accepting Authority

For and on behalf of Accepting Authority

Signature \_\_\_\_\_

Name \_\_\_\_\_

Designation \_\_\_\_\_

Dated \_\_\_\_\_

Note:

**\* For Proprietary Concerns**

Shri \_\_\_\_\_ son of \_\_\_\_\_ resident of \_\_\_\_\_ carrying on business under the name and style of \_\_\_\_\_ at \_\_\_\_\_ (hereinafter called “the said Contractor” which expression shall unless the context requires otherwise include his heirs, executors, administrators and legal representatives).

**\* For Partnership Concerns**

1. Shri \_\_\_\_\_ son of \_\_\_\_\_ resident of \_\_\_\_\_.
2. Shri \_\_\_\_\_ son of \_\_\_\_\_ resident of \_\_\_\_\_ carrying on business in co-partnership under the name and style of \_\_\_\_\_ at \_\_\_\_\_ (hereinafter collectively called “the said Contractor” which expression shall unless the context requires otherwise include each of them and their respective heirs, executors, administrators and legal representatives).

**\* For Companies**

M/s. \_\_\_\_\_ a company registered under the Companies Act, 1956 and having its registered office in the State of \_\_\_\_\_ (Hereinafter called “the said Contractor” which expression shall unless the context requires otherwise include its administrators, successors and assignees).

**FORM OF BANK GUARANTEE IN LIEU OF SECURITY DEPOSIT IN INDIVIDUAL CONTRACT**

(On Non-Judicial Stamp Paper)

To  
Superintending Engineer,  
.....(ACCEPTING AUTHORITY)

In consideration of the .....(ACCEPTING AUTHORITY) having its head office at ..... (which expression shall unless repugnant to the subject or context includes its administrators, successors and assignees) having agreed under the terms and conditions of Contract Agreement No. \_\_\_\_\_ dated \_\_\_\_\_ made between \_\_\_\_\_ and .....(ACCEPTING AUTHORITY) connection with the work of \_\_\_\_\_ (hereinafter called the said contract), to accept a Deed of Guarantee as herein provided for Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) from a Nationalised/Scheduled Bank in lieu of the security deposit to be made by the Contractor or in lieu of the deduction to be made from the Contractor's bills, for the due fulfillment by the said Contractor of the term and conditions contained in the said Contract, We the \_\_\_\_\_ Bank (hereinafter referred to as "the said Bank" and having our registered office at \_\_\_\_\_ do hereby undertake and agree to indemnify and keep indemnified .....(ACCEPTING AUTHORITY) from time to time to the extent of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) against any loss or damage, cost, charges and expenses caused to or suffered by or that may be caused to or suffered by .....(ACCEPTING AUTHORITY) by reason of any breach or breaches by the said Contractor of any of the terms and conditions contained in the said contract and to unconditionally pay the amount claimed by .....(ACCEPTING AUTHORITY) on demand and without demur to the extent aforesaid.

2. We, the \_\_\_\_\_ Bank, further agree that .....(ACCEPTING AUTHORITY) shall be the sole judge of and as to whether the said contractor has committed any breach or breaches of any of the terms and conditions of the said contract and the extent of loss, damage, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by ....(ACCEPTING AUTHORITY) on account thereof and the decision of .....(ACCEPTING AUTHORITY) that the said Contractor has committed such breach or breaches and as to the amount or amounts of loss, damage, costs, charges and expenses caused to or suffered to or suffered by or that may be caused to or suffered by ....(ACCEPTING AUTHORITY) from time to time shall be final and binding on us.

3. We, the said Bank, further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and till at the dues of .....(ACCEPTING AUTHORITY) under, the said Contract or by virtue of any of the terms and conditions governing the said Contract have been fully paid and its claimed satisfied or discharge and till the Accepting Authority of the contract certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said Contractor and accordingly discharges this Guaranty subject, however, that .....(ACCEPTING AUTHORITY) shall have no claim under this Guarantee after 90 (Ninety) days from the date of expiry of the defects Liability period as provided in the said Contract. ie. \_\_\_\_\_ (date) or from the date of cancellation of the said Contract, as the case may be unless a notice of the claim under this Guaranty has been



served on the Bank before the expiry of the said period in which case the same shall be enforceable against the Bank notwithstanding the fact that the same is enforced after the expiry of the said period.

4. ....(ACCEPTING AUTHORITY) shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee or Indemnity from time to time to vary any of the terms and conditions of the said contract or to extended time of performance by the said Contractor or to postpone for any time and from time to time any of the powers exercisable by it against the said Contractor and either to enforcing or forbear from enforcing any of terms and conditions governing the said Contract or securities available to ....(ACCEPTING AUTHORITY) and the said Bank shall not be released from its liability under these presents by any exercise by ....(ACCEPTING AUTHORITY) if any liberty with reference to the matters aforesaid or by reason of time being given to the said Contractor or any other forbearance, act or omission on the part of ....(ACCEPTING AUTHORITY) or any indulgence by ....(ACCEPTING AUTHORITY) to the said Contractor or any other ....(ACCEPTING AUTHORITY) matter or thing whatsoever which under the law relating so sureties would but for this provision have the effect of so releasing the Bank from its such liability.
5. It shall not be necessary for .....(ACCEPTING AUTHORITY) to proceed against the Contractor before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank, not withstanding any security which .....(ACCEPTING AUTHORITY) may have obtained or obtain from the Contractor at the time when proceedings are taken against the Bank hereunder be outstanding or unrealised.
6. We, the said bank, lastly undertake not to revoke this Guarantee during its currency except with the previous consent of ....(ACCEPTING AUTHORITY) in writing and agree that any change in the Constitution of the said Contractor or the said Bank shall not discharge our liability hereunder.

Dated this ..... Day of .....

In presence of:

WITNESS

1. For and on behalf of (The Bank)  
  
Signature .....
- Name & Designation .....  
.....
2. Authorisation No. ....  
  
Name & Place .....  
  
Bank's Seal .....

The above Guarantee is accepted by .....(ACCEPTING AUTHORITY)

For and on behalf of .....(ACCEPTING AUTHORITY)

Signature \_\_\_\_\_  
Name \_\_\_\_\_  
Designation \_\_\_\_\_  
Dated \_\_\_\_\_

Note:

**\* For Proprietary Concerns**

Shri \_\_\_\_\_ son of \_\_\_\_\_ resident of \_\_\_\_\_  
carrying on business under the name and style of \_\_\_\_\_ at \_\_\_\_\_  
(hereinafter called “the said Contractor” which expression shall unless the context requires  
otherwise include his heirs, executors, administrators and legal representatives).

**\* For Partnership Concerns**

1. Shri \_\_\_\_\_ son of \_\_\_\_\_ resident of \_\_\_\_\_.
2. Shri \_\_\_\_\_ son of \_\_\_\_\_ resident of \_\_\_\_\_  
\_\_\_\_\_ carrying on business in co-partnership under the name  
and style of \_\_\_\_\_ at \_\_\_\_\_ (hereinafter collectively called  
“the said Contractor” which expression shall unless the context requires  
otherwise include each of them and their respective heirs, executors,  
administrators and legal representatives).

**\* For Companies**

M/s. \_\_\_\_\_ a company registered under the Companies Act, 1956 and having its  
registered office in the State of \_\_\_\_\_ (Hereinafter called “the said Contractor”  
which expression shall unless the context requires otherwise include its administrators,  
successors and assignees).

## PROFORMA OF PRELIMINARY AGREEMENT

(To be executed on stamp paper of value Rs.200/- and submitted along with tender).

Preliminary agreement entered into on this ..... day of ..... Between ..... (Hereinafter called ..... on one part and Shri..... (name and address of the Contractor) (Hereinafter called the Contractor) on the other part for the execution of the agreement as well as the execution of the (Name of Work). And where as the notice inviting tenders it is stated as follows. Before commencing the work of within a week of the date when the acceptance of tender has been intimated to him, the tenderer shall deposit an additional sum of Rs.....which together with the amount of earnest money deposited shall be treated as security for the proper fulfillment of the same and he shall execute an agreement for the work in the scheduled form of agreement. If he fails to do this or fail to maintain a specified rate of progress, the security deposit shall be forfeited to ..... and fresh tenders shall be called for or the matter otherwise disposed. If as a result of such measures due to the default of the tender to pay the requisite deposit sign contracts to take possession of the work any loss to the ..... results, the same will be recovered from him as arrears of revenue but should it be a saving to ..... the original contractor shall have no claim whatever to the difference. Recoveries to this or any other account will be made from the sum that may be due to contractor on this or any other contracts or under the Revenue Recovery Act or otherwise as ..... may decide.

Now therefore these present witness and it is mutually agreed as follows:

1. The terms and condition for the said contract having been stipulated in the said tender form to which the contractor has agreed, a copy of which is appended, and which forms part of this agreement, it is agreed that the terms and conditions stipulated there in shall bind the parties to this agreement, except to the extent to which they are abrogated or altered by express terms and conditions herein, agreed to and in which respect the express provisions herein shall supercede those of the said tender form.
2. The Contractor hereby agree and under take to perform and fulfill all the operation and obligations connected with the execution of the said contract work viz. (Name of the work)
3. If the Contractor does not come forward to execute the original agreement after the said work is awarded and letter of acceptance issued in his favour or commits breach of any of the conditions of the contract as stipulated in clause 1.10.3 of the Notice inviting Tenders as quoted above within the period stipulated, ..... may rearrange the works otherwise or get it done otherwise at the risk and cost of the contractor and the loss so sustained by ..... can be realising from the contractor under the Revenue Recovery Act as if arrears of land revenue as assessed, quantified and fixed by an adjudicating authority consisting of ..... or

any other officer or officers authorised by ..... taking into consideration the prevailing rates and after giving due notice to the Contractor. The decision taken by such authorised officer or officers shall be final and conclusive and shall be binding on the contractor.

4. The contractor further agrees that any amount found due to ..... under or by virtue of this agreement shall be recoverable from the Contractor from the Contractor from his EMD and his properties, movable and immovable as arrears of land revenue under the provision of the Revenue Recovery Act for the time being in force or in any other manner as ..... may deem fit in this regard.

In witness where of Sri....., ....., ..... and Sri.....

Contractor, have set their hands on the day and year first above written,

Signed by Sri....., .....

In the presence of witness

1. ....

2. ....

Signed and delivered by Sri....., Contractor.

**PROFORMA FOR PREQUALIFICATION OF CONTRACTORS**

<b>Project Name</b>	<b>Name of the Client</b>	<b>Description of Work</b>	<b>Contract No.</b>	<b>Value of Contract (Rs. in crores)</b>	<b>Date of Work Order</b>	<b>Stipulated Period of Completion</b>	<b>Actual period of completion</b>	<b>Remarks Explain Reasons for delay, if any.</b>

Enclose satisfactory completion certificate and date of completion from the concerned Engineer-in-charge not below the rank of Executive Engineer in the case of Govt. or Chief executive /Chief Project Manager in the case of Private Organization.

**SIGNATURE OF BIDDER**