

उत्तर प्रदेश UTTAR PRADESH

FD 192333

DE. CASHIER

26 AUG 2019

AGREEMENT

Today on this date 23rd September 2019, this agreement is executed between

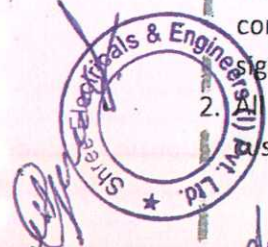
Part 1: Chief Executive Officer, Agra Smart City Ltd. (ASCL) (here in after called as CEO of ASCL)

And

Part 2: M/s.Shree Electrical and Engineers Pvt Ltd, Pune (here in after called as contractor)

It is evident that the minimum quoted bid for the project, " Supply Installation Testing and Commissioning of 11/0.433KV substation for ASCL Complex data center and ICC" have been received from M/s.Shree Electrical and Engineers Pvt Ltd ,Pune, which is 0.01% below from estimated cost, amounting to Rs. 2,44,29,704.00 (Rupees two crores fourty four lakhs twenty nine thousand seven hundred four)+ 18% G.S.T Rs.43,97,346.72(Rupees forty three lakhs ninety seven thousand three hundred fourty six and seventy two paise)+ 1% labour cess Rs. 2,44,297.04 (Rupees two lakhs fourty four thousand two hundred ninety seven and four paise). Total amount of project including G.S.T of Rs. 2, 90, 71,347.76 (Rupees two crores ninety lakhs seventy one thousand three hundred fourty seven and seventy six paise) and that this has been approved by the Chairman, ASCL and intimated the contractor vide letter no. 253/ASCL/2019-20 dated 31.08.2019.

1. That the contractor, along with his representatives and successors have themselves bound through this agreement wherein, he has agreed and signed all the terms and conditions of Agra Smart City Ltd. , Engineering Department and that both parties have signed, is related to it and shall be treated a part of it.
2. All work shall be measured net by standard measure and according to the rules and customs of the Public Works Department and without reference to any local custom.



Chief Executive Officer
Agra Smart City Limited

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19/11/19

ग्राम्य विकास की तिथि
राष्ट्रिय क्रय करने का प्रयोजन
ग्राम्य नेता का नाम व पूरा पता
ग्राम्य की जनसंख्या

कृष्ण मुनी शर्मा
सा.नं०-12 बरबि 31-3
दीवानी कपहरी, बरबि

रहीसिंह
पुनः



Under no circumstances shall the contractor be entitled to claim enhanced rates for items in this contract.

3. That the contractor has submitted Fixed Deposit Receipt of State Bank of India, (Name of Bank) ,Branch- Shivaji Nager, Veer Chaphekar Chowk, University Road, Pune (Name of Branch) of No: 8531955091-7 (FDR Number) dated on 21st September 2019 (Date of Issue) amounting to Rs 12,21,486.00 (Amount of FDR) as Security deposit to Agra Smart City Ltd. in order to regularize the work under this contract. The responsibility of validity of the same shall be that of the contractor.
4. That the detailed conditions of GCC (General Conditions of Contract) PWD Uttar Pradesh shall be a part of this agreement and any violation of any terms and conditions mentioned therein shall be treated as breach of this contract.
5. The start date will be 30.09.2019 and the date of completion shall be 30.12.2019.
6. Defect liability period and Operation & maintenance period will be calculated from date of completion.
7. Before signing the First and Final bill/Running Account bill/Final bill, the ASCL should see that:

- a) The statutory deduction on account of Income tax wherever due has been made from the amount of the bill of Contractor. And
- a) Deduction of Building and other Workers' Cess Act 1996 Cess Act is a there is a statutory provision for deduction of tax at source i.e. from contractor's bill.
- b) Part or complete payment will be made only on satisfactory completion of work in full / part thereof and value of work executed shall be determined based on the measurements and check measurements by the Engineer in the Measurement Book.
- c) For every Bill, 18% GST (extra) will be paid to the contractor based on the value of the work done for Construction by the ASCL. After the payments including 18% of GST, the Contractor should pay the GST amount to Government through his GST Registration No. and produce a copy to the ASCL.

i. First Bill Payment:

At the time of payment for first running account bill, the contractor should produce the GST paid details on goods (Materials) to the ASCL for ITC (Input Tax Credit).

ii. Intermediate Bill Payment (Running Account Bill):

At the time of payment of next running account bill, the contractor should produce the GST paid details of services up to previous bill payment (i.e. GST paid detail for the previous work bill) along with Input Tax Credit (ITC) availed at the time of payment of running account bill to the ASCL.


iii. Final Bill Payment:

The contractor should produce the GST paid details for all the materials used for construction work and GST paid details of services for up to previous payment (i.e. GST paid detail for up to previous work bill) to the ASCL along with Input Tax Credit (ITC) availed at the time of payment of final bill to the ASCL.

iv. Submission of GST paid details of Final Bill

The GST paid details for the final work bill payment of construction work has to be submitted by the contractor to ASCL within one month after getting payments.




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उत्तर प्रदेश UTTAR PRADESH

81AD 837378

Undertaking

Letter of Oath / from undertaking M/s.Shree Electrical and Engineers Pvt Ltd, Pune
swearer, sworn to take following undertaking:

1. That the swearer had been awarded following work from Agra Smart City Limited:

Name of work: "Supply Installation Testing and Commissioning of 11/0.433KV substation for ASCL Complex data center and ICC.".

2. That this agreement is being executed on Rs. 100 stamp paper in sequence of G.O. number वि०क०नि०-५-१७१२/ग्यारह-२००६-५०० (डक्यू-२९)/२००५, dated 2 May, 2006 and in reference to letter no. सं०-८५३८शा/४१ स्टाम्प रजि. शुल्क/नि०से०/९६-९७ dated ३०/११/२००६ from Directorate, Local Bodies, ८th Floor, Indra Bhawan, Lucknow.
3. That till the final decision is not made in favour of State Government under the Special Leave Petition (SLP) filed by the State Government in Hon'ble Supreme Court, New Delhi in Stamp Case; above said contract is being signed on Rs. 100 stamp paper under Indian Stamp Act schedule 1(b), paragraph-57.

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That I, swearer gives undertaking that in case the decision comes in favour of State Government under pending Special Leave Petition (SLP) in Hon'ble Supreme Court, New Delhi; then, I, Contractor / Swearer shall be liable for the payment of more than Rs. 100 stamp duty within two (02) months of the decision in above said S.L.P. in favour of Agra Smart City Limited, Agra.

Chief Executive Officer
Agra Smart City Limited

Shree Electricals & Engineers (P) Ltd
Contractor/Swearer

1009
10/11/19

1. 1009 बिक्रम की तिथि

2. टाप्प कर देने का प्रयोजन

3. टाप्प क्रेता का नाम व पूरा पता

4. टाप्प की हनराहिर

श्री. इलेक्ट्रॉनिक ठस इंडिया प्रा. लि.
मुंबा



कृष्ण मुरली शर्मा

साल-12 अक्टूबर 31-3

दीवानी कचहरी, शाहद

Section 4

Part I General Conditions of Contract

A. General

1. Definitions

- 1.1. Terms, which are defined in the Contract Data, are not also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.

Compensation Events are those defined in Clause 40 hereunder.

The Completion Date is the date of completion of the Works as certified by the Engineer, in accordance with Clause 48.1.

The Contract is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in Clause 2.3.

The Contract Data defines the documents and other information, which comprise the Contract.

The Contractor is a person or corporate body who's Bid to carry out the Works, including routine maintenance, has been accepted by the Employer.

The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer.

The Contract Price is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; months are calendar months.

A Defect is any part of the Works not completed in accordance with the Contract.


The Defects Liability Certificate is the certificate issued by Engineer, after the Defect Liability Period has ended and upon correction of Defects by the Contractor.

The Defects Liability Period is Two years calculated from the Completion Date.

Drawings include calculations and other information provided or approved by the Engineer for the execution of the Contract.

The Employer is the party as defined in the Contract Data, who employs the Contractor to carry out the Works, including Routine maintenance,. The Employer may delegate any or all functions to a person or body nominated by him for specified Functions.




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The Engineer is the person named in the Contract Data (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Engineer) who is responsible for supervising the execution of the Works and administering the Contract.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The Initial Contract Price is the Contract Price listed in the Employer's Letter of Acceptance.

The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works.

The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer by issuing an extension of time.

Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.

Plant is any integral part of the Works that shall have a mechanical, electrical, electronic, chemical, or biological function.

The Site is the area defined as such in the Contract Data.

Site Investigation Reports are those that were included in the bidding documents and are reports about the surface and subsurface conditions at the Site.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Engineer.

The Start Date is given in the Contract Data. It is the date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

A Sub-Contractor is a person or corporate body who has a Contract with the Contractor to carry out a part of the Electrical work in the Contract, which includes work on the Site.

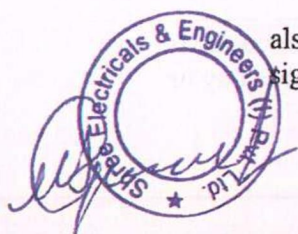
Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for Electrical work or installation of the Works.

A. Variation is an instruction given by the Engineer, which varies the Works.

The Works, as defined in the Contract Data, are what the Contract requires the Contractor to construct, install, maintain, and turn over to the Employer. Routine maintenance is defined separately.

2. Interpretation

In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract



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unless specifically defined. The Engineer will provide instructions clarifying queries about these Conditions of Contract.

If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

The documents forming the Contract shall be interpreted in the following order of priority:

- (1) Agreement,
- (2) Notice to Proceed with the Work,
- (3) Letter of Acceptance,
- (4) Contractor's Bid
- (5) Contract Data,
- (6) Special Conditions of Contract Part II,
- (7) General Conditions of Contract Part I,
- (8) Specifications,
- (9) Drawings,
- (10) Bill of Quantities, and
- (11) Any other document listed in the Contract Data.

3. Language and Law.

The language of the Contract and the law governing the Contract are stated in the Contract Data.

4. Engineer's Decisions

Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer. However, if the Engineer is required under the rules and regulations and orders of the Employer to obtain approval of some other authorities for specific actions, he will so obtain the approval.

Except as expressly stated in the Contract, the Engineer shall not have any authority to relieve the Contractor of any of his obligations under the contract.

5. Delegation

The Engineer, with the approval of the Employer, may delegate any of his duties and responsibilities to other people, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

6. Communications

All Certificate, notices or instructions to be given to the contractor by Employer / Engineer shall be sent on the address or contact details given by the contractor in Section 6- Form of Bid. The address and contact details for communication with the Employer/ Engineer shall be as per the details given Contract Data to GCC. Communications between parties that are referred to in the conditions

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shall be in writing. The Notice sent by Facsimile (fax) or other electronic means shall be effective on confirmation of the transmission. The Notice sent by Registered post or Speed post shall be effective on delivery or at the expiry of the normal delivery period as undertaken by the postal service.

7. Subcontracting

7.1- The contractor may subcontract part of the Electrical work with the approval of the Employer in writing, up to 25% of the contract price but will not assign the Contract. Subcontracting shall not alter the contractor's obligations.

Beyond what has been stated in clauses 7.1, if the contractor proposes subcontracting any part of the work during execution of the works, because of some unforeseen circumstances to enable him to complete the work as per terms of the contract, the Employer will consider the following before according approval:

- a. The Contractor shall not sub-contract the whole of the works.
- b. The Contractor shall not sub-contract any part of the work without prior consent of the Employer. Any such consent shall not relieve the contractor from any liability or obligation under the contract and he shall be responsible for the acts, defaults and neglects of any his sub-contractor, his agents or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents and workmen.

The Engineer should satisfy himself before recommending to the Employer whether

- a. The circumstances warrant such sub-contracting: and
- b. The sub-contractor so proposed for the work possess the experience, qualification and equipment necessary for the job proposed to be entrusted to him in proportion of the Quantum of works to be sub-contracted.

8. Other Contractors

The contractor shall co-operate and share the site with other contractors. Public authority's utilities and the employer between the dates given in the schedule of other contractors, as referred to in the contract data. The contractor shall also provide facilities and services for them as described in the schedule. The employer may modify the schedule of other contractor, and shall notify the contractor of any such modification.

9. Personnel

The Contractor shall employ for the Electrical work work and routine maintenance the technical personnel named in the Contract Data or other technical persons approved by the Engineer. The Engineer will approve any proposed replacement of technical personnel only if their relevant qualifications and abilities are substantially equal to or better than those of the personnel stated in the Contract Data.

If the Engineer asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the Works in the Contract.

The Contractor shall not employ any retired Gazetted officer who has worked in the Engineering Department of the State Government and has either not

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completed two years after the date of retirement or has not obtained State Government's permission to employment with the Contractor.

10. Employer's and Contractor's Risks

The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks that this Contract states are Contractor's risks

11. Employer's Risks

The Employer is responsible for the excepted risks which are (a) in so far as they directly affect the execution of the Works in the Employer's country, the risks of war, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), natural calamities and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or (b) a cause due solely to the design of the Works, other than the Contractor's design.

12. Contractor's Risks

All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks, referred to in clause 11.1, are the responsibility of the Contractor.

13. Insurance

The Contractor at his cost shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the date of completion, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor's risks:

- a) loss of or damage to the Works, Plant and Materials;
- b) loss of or damage to equipment;
- c) loss of or damage to property (except the Works, Plant, Materials, and equipment) in connection with the Contract; and
- d) Personal injury or death.

Insurance policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the completion date/ Start Date. All such insurance shall provide for compensation to be payable in Indian Rupees to rectify the loss or damage incurred.

(a) The Contractor at his cost shall also provide, in the joint names of the Employer and the Contractor, insurance cover from the date of completion to the end of defect liability period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor's risks:

- (a) Personal injury or death.
- (b) Insurance policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the completion date/ start date. All such insurance shall provide for compensation to be payable in Indian Rupees.

Alterations to the terms of insurance shall not be made without the approval of the Engineer.

Both parties shall comply with any conditions of the insurance policies.

14. Site Investigation Reports

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The Contractor, in preparing the Bid, may rely on any Site Investigation Reports referred to in the Contract Data, supplemented by any other information available to him, before submitting the bid.

15. Queries about the Contract Data

The Engineer will clarify queries on the Contract Data.

16. Contractor to Construct the Works

The Contractor shall construct, and install and maintain the Works in accordance with the Specifications and Drawings.

The contractor shall construct the works with intermediate technology, i.e., by manual means with medium input of machinery required to ensure the quality of works as per specifications. The contractor shall deploy the equipment and machinery as given in Contract Data.

1. The Works to Be Completed by the Intended Completion Date

The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Programme submitted by the Contractor, as updated with the approval of the Engineer, and complete them by the Intended Completion Date.

2. Approval by the Engineer

The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Engineer, who is to approve them.

The Contractor shall be responsible for design of Temporary Works.

The Engineer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer before their use.

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3. Safety and Mandatory Compliance

The Contractor shall be responsible for the safety of all activities on the Site. Will ensure all safety parameters are met in Accordance to vidhyut Surakhsha department, and relevant NOC are to be undertaken on behalf of ASCL, which needs to be submitted in original to the employer. All necessary cost incurred will be borne by bidder. The bidder need to comply the following for over all commissioning of substation as a solution:

- i. DTC installation.
- ii. CB/TPMO installation.
- iii. LT Panel Installation

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- iv. DES NOC
- v. Fire NOC
- vi. Test Report.
- vii. Safety Challan

Coordination/ liaisoning needful for above as mentioned will be in bidder scope and originals/ photocopy of all relevant are needful to submit to ASCL and authority as necessary. Also as per section 1.3.8 of **General Technical Requirement "Specification of Electrical Items in compliance with ASCL DC/ICCC"** Bidder has to comply all Third party quality assurance audits as an when decided by ASCL for the complete solution relating to scope of work.

4. Discoveries

Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them.

21. Possession of the Site

The Employer shall handover complete or part possession of the site to the Contractor 7 days in advance of Electrical work program. At the start of the work, the employer shall handover the possession of at-least 75% of the site.

22. Access to the Site

The Contractor shall allow access to the Site and to any place where work in connection with the Contract is being carried out, or is intended to be carried out to the engineer and any person/persons/agency authorized by:

- a. The Engineer
- b. The Employer

Instructions

The Contractor shall carry out all instructions of the Engineer, which comply with the applicable laws where the Site is located.

23. Dispute Redressal System

If any dispute or difference of any kind what-so-ever shall arises in connection with or arising out of this Contract or the execution of Works or maintenance of the Works there under, whether before its commencement or during the progress of Works or after the termination, abandonment or breach of the Contract, it shall, in the first instance, be referred for settlement to the competent authority, described along with their powers in the Contract Data, above the rank of the Engineer, The competent authority shall, within a period of forty-five days after being requested in writing by the Contractor to do so, convey his decision to the Contractor. Such decision in respect of every matter so referred shall, subject to review as hereinafter provided, be final and binding upon the Contractor. In case the Works is already in progress, the Contractor shall proceed with the execution of the Works, including maintenance thereof, pending receipt of the decision of the competent authority as aforesaid, with all due diligence.

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Either party will have the right of appeal, against the decision of the competent authority, to the arbitration if the amount appealed exceeds rupees one lakh.

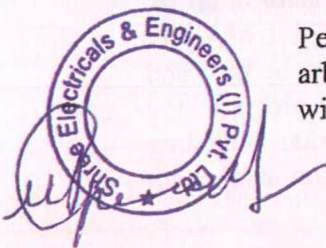
24. Procedure for Resolution of Disputes

- 24.0.1. The Competent Authority mentioned in clause 24.1 shall give a decision in writing within 45 days of receipt of a notification of a dispute.
- 24.0.2. Either party may refer a decision of the Competent Authority to Arbitration within 28 days of the Competent Authority's written decision. Arbitration shall be under the Arbitration and Conciliation Act 1996. If neither party refers the dispute to Arbitration within the above 28 days, the Competent Authority's decision will be final and binding.
- 24.0.3. The Arbitration shall be conducted in accordance with the following procedure, in case Initial Contract Price is more than Rs. 5 Crore or the Contractor is a Foreign Contractor, who has bid under ICB:-
- In case of a decision of the Competent Authority in a dispute or difference arising between the Employer and a Contractor relating to any matter arising out of or connected with this Agreement, the matter will be referred to an Arbitral Tribunal. The Arbitral Tribunal shall consist of three Arbitrators, one each to be appointed by the Employer and the contractor. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the parties and shall act as presiding Arbitrator. In case of failure of the two Arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the Arbitrator appointed subsequently, the presiding Arbitrator shall be appointed by the CEO of ASCL.
 - If one of the parties fails to appoint its arbitrator in pursuance of sub-clause (a) above within 30 days after receipt of the notice of the appointment of its arbitrator by the other party, then the CEO of ASCL appoints the arbitrator. A certified copy of the order of the CEO of ASCL making such an appointment shall be furnished to each of the parties.
 - The decision of the majority of arbitrators shall be final and binding upon both parties. The cost and expenses of Arbitration proceedings will be paid as determined by the Arbitral Tribunal. However, the expenses incurred by each party in connection with the preparation, presentation etc. of its proceedings as also the fees and expenses paid to the arbitrator appointed by such party or on its behalf shall be borne by each party itself.

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Where the Initial Contract Price as mentioned in the Acceptance Letter is Rs. 5 Crore and below, disputes and differences in which an Adjudicator has given a decision shall be referred to a sole Arbitrator. The sole Arbitrator would be appointed by the agreement between the parties; failing such agreement within 15 days of the reference to arbitration, by the appointing authority, namely CEO of ASCL. **Arbitration Proceedings shall be held at Agra (U.P.), India**, and the language of the arbitration proceedings and that of all documents and communications between the parties shall be Hindi & English.

Performance under the contract shall continue even after reference to the arbitration and payments due to the contractor by the Employer shall not be withheld, unless they are the subject matter of the arbitration proceedings.



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B. TIME CONTROL

25. Programme

Within the time stated in the Contract Data, the Contractor shall submit to the Engineer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works, along with monthly cash flow forecasts for the Electrical work of works.

The Contractor shall submit the list of equipment and machinery being brought to site, the list of key personnel being deployed, the list of machinery/ equipments being placed in field laboratory and the location of field laboratory along with the Program. The Engineer shall cause these details to be verified at each appropriate stage of the program.

An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining Works, including any changes to the sequence of the activities.

The Contractor shall submit to the Engineer for approval an updated Program at intervals of 30 Days no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.

The Engineer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Engineer again at any time. A revised Program shall show the effect of Variations and Compensation Events.

26. Extension of the Intended Completion Date

The Engineer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining Works, which would cause the Contractor to incur additional cost

The Engineer shall decide whether and by how much time to extend the Intended Completion Date within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

27. Delays Ordered by the Engineer

The Superintending Engineer may instruct the Contractor to delay the start or progress of any activity within the Works. Delay/delays totalling more than 30 days will require prior written approval of the Employer.

28. Management Meetings

The Engineer may require the Contractor to attend a management meeting. The business of a management meeting shall be to review the plans for the Works.

- 28.1.1. The Engineer shall record the business of management meetings and provide copies of the record to those attending the meeting. The responsibility of the parties for actions to be taken shall be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all those who attended the meeting.

C. Quality Control

29. Identifying Defects

The Engineer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect.

30. Tests

Contractor/Bidder is liable to submit all electrical test reports required for the above scope of work in accordance to the prevailing acts and rules of the government. It is not limited to particular equipment / substation or overall integration. All cost incurred to carry out such tests and audits will be borne by bidder/contractor within electrical scope of work.

Correction of Defects noticed during the Defect Liability Period for two year.

- 30.0.1. The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion of work. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

- 30.0.2. Every time notice of Defect/Defects is given, the Contractor shall correct the notified Defect/Defects within the duration of time specified by the Engineer's notice.

The RFI system will be followed for execution of work.

31. Uncorrected Defects

If the Contractor has not corrected a Defect pertaining to the Defect Liability Period under clause 32.1.1 and of these Conditions of Contract, to the satisfaction of the Engineer, within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will pay this amount, on correction of the Defect.

D. Cost Control

32. Bill of Quantities

The Bill of Quantities shall contain items for the Electrical work, installation, testing, and commissioning, maintaining works, and lump sum figures for yearly routine maintenance for each of the five years separately, to be done by the Contractor.

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The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item for the Electrical work. The payment to the Contractor is performance based for routine maintenance of Substation electrical equipment.

33. Variations

The Engineer shall, having regard to the scope of the Works and the sanctioned estimated cost, have power to order, in writing, Variations within the scope of the Works he considers necessary or advisable during the progress of the Works. Such Variations shall form part of the Contract and the Contractor shall carry them out and include them in updated Programs produced by the Contractor. Oral orders of the Engineer for Variations, unless followed by written confirmation, shall not be taken into account.

34. Payments for Variations

If rates for variation items are specified in Bill of Quantity, the contractor shall carry out such work at the same rate. This shall apply for variation only up to the limit prescribed in the contract data. If the variation exceeds this limit, the rates shall be derived under the provision of clause 36.3 for quantities (higher or lower) exceeding the deviation limit.

If the rates for Variation are not specified in the Bill of Quantities, the Engineer shall derive the rate from similar items in the Bill of Quantities.

If the rate for Variation item cannot be determined in the manner specified in Clause 36.1 or 36.2, the Contractor shall, within 14 days of the issue of order of variation work, inform the Engineer the rate which he proposes to claim, supported by analysis of the rates. The Engineer shall assess the quotation and determine the rate based on prevailing market rates within one month of the submission of the claim by the Contractor. As far as possible, the rate analysis shall be based on the standard data book and the current schedule of rates of the district public works division. The decision of the Engineer on the rate so determined shall be final and binding on the Contractor.

35. Cash Flow Forecasts

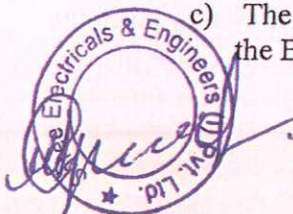
When the Program is updated, the Contractor shall provide the Engineer with an updated cash flow forecast.

36. Payment Certificates

The payment to the contractor will be as follows for Electrical work:

- The Contractor shall submit to the Engineer fortnightly/ monthly statements of the value of the work executed less the cumulative amount certified previously supported with detailed measurement of the items of work executed in measurement books authorized by Project Engineer ASCL.
- The Engineer shall check the Contractor's fortnightly/monthly statement within 14 days and certify the amount to be paid to the Contractor.
- The value of work executed shall be determined, based on measurements by the Engineer.

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- d) The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed.
- e) The value of work executed shall also include the valuation of Variations and Compensation Events.
- f) The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.
- g) The Payment of final bill shall be governed by the provisions of clause 50 of GCC.

37. Payments

Payments shall be adjusted for deductions for advance payments security deposit, other recoveries in terms of the Contract and taxes at source, as applicable under the law. The Engineer shall pay the Contractor the amounts he had certified within 15 days of the date of each certificate.

The Employer may appoint another authority, as specified in the Contract Data (or any other competent person appointed by the Employer and notified to the contractor) to make payment certified by the Engineer.

Items of the Works for which no rate or price has been entered in the Bill of Quantities, will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

The Payment will be made on following stages on successful submission of all relevant documents towards completion of each phase only:

Sr.No.	Description	Payment percentage of Contract Value
01	Resource Mobilization/ Advance	10%
02	Supply and Installation of Material	60%
03	Testing and Commissioning of Site	25%
04	Maintenance for 3 years post DLP of two years against bank guarantee submission post completion certificate	05%

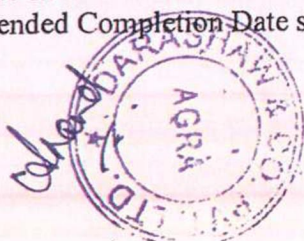
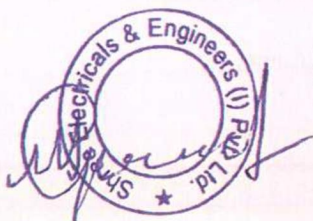
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38. Compensation Events

The following shall be Compensation Events unless they are caused by the Contractor

- a) The Engineer orders a delay or delays exceeding a total of 30 days.
- b) The effects on the Contractor of any of the Employer's Risks.

If a Compensation Event would prevent the Works being completed before the Intended Completion Date, the Intended Completion Date shall be extended. The Engineer shall decide whether and by how much the Intended Completion Date shall be extended.



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39. Tax

The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other levies, duties, royalties, cess, toll, taxes of Central and State Governments, local bodies and authorities that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.

40. Currencies

All payments will be made in Indian Rupees.

41. Security Deposit/ Retention and Release of Performance Security and Security Deposit/ Retention.

The Employer shall retain security deposit of 5% of the amount from each payment due to the Contractor until completion of the whole of the Electrical Work. No. security deposit/ retention shall be retained from the payments for Routine maintenance of Works.

On the completion of the whole of the Electrical work half the total amount retained as Security Deposit is repaid to the contractor and half when the defect liability period has passed and the Engineer has certified that all defects notified by the Engineer to the contractor before the end of his period have been corrected.

The additional performance security for unbalanced bids as detailed in Clause 51 of Conditions of Contract is repaid to the contractor when the Electrical work work is complete.

The performance security equal to the five percent of the contract price in Clause 51 of Conditions of contract is repaid to the contractor when the period of two years finished or defect liability period is over and the Engineer has certified that the contractor has satisfactorily carried out the Works.

If the contractor so desires then the Security Deposit can be converted into any interest bearing security of schedule commercial bank in the name of the Employer or National Saving Certificates duly pledged in favor of the Employer for Defect Liability Period.

42. Liquidated Damages

The Contractor shall pay liquidated damages to the Employer at the rate of 1% of remaining work to be delivered per week or part thereof stated in the Contract Data for the period that the Completion Date is later than the Intended Completion Date.

Liquidated damages at the same rate shall be withheld if the Contractor fails to achieve the milestones prescribed in the Contract Data. However, in case the Contractor achieves next milestone the amount of the liquidated damages already withheld shall be restored to the Contractor by adjustment in the next payment certificate. The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from



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payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's other liabilities.

If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate.

43. Advance Payment

The Employer will make the following advance payment to the contractor against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a Commercial bank acceptable to the Employer in amounts equal to the advance payment:

- a) Mobilization advance up to 10 percent of the contract price.
- b) Equipment advance up to ninety percent of the cost of the new equipment brought to the site against line item, subjects to a maximum of 10 percent of the contract price.

The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on advance payment.

The Contractor is to use the advance payment only to pay for equipment, plant and mobilization expenses required specifically for execution of works. The Contractor shall demonstrate the advance payment as been used in this way by supplying copies of invoices or other documents to the Engineer.

The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor for the Electrical work, following the schedule of completed percentage of the work on payment basis. No account shall be taken of the advance payment or the repayment in assessing valuation of work done. Variations, price adjustments, Compensation events or liquidated damages.

44. Securities

The Performance Security equal to five percent of the contract price and additional security for unbalanced bids shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in the form given in the Contract Data and by a scheduled commercial bank. The Performance Security shall be valid until a date 45 days from the date of expiry of Defect Liability Period and the additional security for unbalanced bids shall be valid until a date 45 days from the date of issue of the certificate of completion.

45. Cost of Repairs

Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at his cost if the loss or damage arises from the Contractor's acts or omissions.



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E. *Finishing the Contract*

46. Completion of Electrical work and Maintenance

The contractor shall request the Engineer to issue a certificate of completion of the Electrical work, and the Engineer will do so upon deciding that the works is completed.

47. Taking Over

The Employer shall take over the works within seven days of the Engineer issuing a certificate of completion of works.

48. Final Account

The contractor shall supply the Engineer with a detailed account of the total amount that the Contractor considers payable for works under the contract within 21 days of issue of certificate of completion of Electrical work. The Engineer shall issue a defect liability certificate and certify any payment that is due to the correct and complete. If the account is not correct or complete, the engineer shall issue within 42 days a schedule that states the scope of the corrections or additions that are necessary. If the account is still unsatisfactory after it has been resubmitted, the Engineer shall decide on the amount payable to the contractor and issue a payment certificate within 28 days of receiving the Contractor's revised account. The payment of final bill for Electrical work will be made within 14 days thereafter.

In case the account is not received within 21 days of issue of Certificate of Completion as provided in clause 50.1 above, the engineer shall proceed to finalize the account and issue a payment certificate within 28 days. The payment of final bill for Electrical work will be made within 14 days thereafter.

49. Operating and Maintenance Manuals

If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

50. Termination

The Employer may terminate the Contract if the Contractor causes a fundamental breach of the Contract.

Fundamental breaches of Contract shall include, but shall not be limited to, the following:

- the Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Engineer;
- the Contractor is declared as bankrupt or goes into liquidation other than for approved reconstruction or amalgamation;



[Signature]
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(c) the Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer;

(d) the Contractor does not maintain a Security, which is required;

(e) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in clause 44.1;

(f) the Contractor fails to provide insurance cover as required under clause 13;

(g) if the Contractor, in the judgment of the Employer, has engaged in the corrupt or fraudulent practice in competing for or in executing the Contract. For the purpose of this clause, "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid process at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

(h) if the Contractor has not completed at least thirty percent of the value of Electrical work required to be completed after half of the completion period has elapsed;

(i) if the Contractor fails to set up a field laboratory with the prescribed equipment, within the period specified in the Contract Data; and

(j) Any other fundamental breaches as specified in the Contract Data.

(k) if the Contractor fails to deploy machinery and equipment or personnel as specified in the contract Data at the Appropriate time.

Notwithstanding the above, the Employer may terminate the Contract for convenience.

If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

51. Payment upon Termination

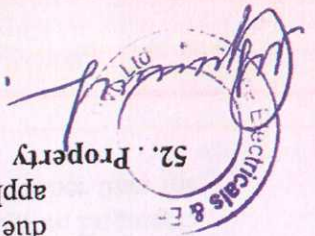
If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done and Materials ordered less liquidated damages, if any less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the Contract Data. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be recovered from the security deposit, and performance security. If any amount is still left un-recovered it will be a debt payable to the Employer.

If the Contract is terminated at the Employer's convenience, the Engineer shall issue a certificate for the value of the work done, the reasonable cost of removal of equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the Contract, and less taxes due to be deducted at source as per applicable law.

52. Property



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All Materials on the Site, Plant, equipment, Temporary Works, and Works shall be deemed to be the property of the Employer for use for completing balance Electrical work if the Contract is terminated because of the Contractor's default, till the Works is completed after which it will be transferred to the Contractor and credit, if any, given for its use.

53. Releases from Performance

If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of the Employer or the Contractor, the Engineer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.

F. Other Conditions of Contract

54. Labor

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labor, local or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labor from time to time employed by the Contractor on the Site and such other information as the Engineer may require.

55. Compliance With Labour Regulations

During continuance of the Contract, the Contractor and his sub Contractors shall abide at all times by all existing labor enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labor law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labor law in future either by the State or the Central Government or the local authority. Salient features of some of the major labor laws that are applicable to Electrical work industry are given in Appendix to Part I General Condition of Contract. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments.

If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/Employer shall have the right to deduct any money due to the Contractor including his amount of performance security.

The Employer/Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.



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The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

56. Drawings and Photographs of the Works

The contractor shall do photography/video photography of the site firstly before the start of the work, secondly mid-way in the execution of different stages of work and lastly after the completion of the work. No separate payment will be made to the contractor for this.

The Contractor shall not disclose details of Drawings furnished to him and works on which he is engaged without the prior approval of the Engineer in writing. No photograph of the works or any part thereof or plant employed thereon, except those permitted under clause 58.1, shall be taken or permitted by the Contractor to be taken by any of his employees or any employees of his sub-Contractors without the prior approval of the Engineer in writing.

No photographs/ Video photography shall be published or otherwise circulated without the approval of the Engineer in writing.

57. The Apprentices Act 1961

The Contractor shall duly comply with the provisions of the Apprentices Act 1961 (III of 1961), the rules made there under and the orders that may be issued from time to time under the said Act and the said Rules and on his failure or neglect to do so he shall be subject to all liabilities and penalties provided by the said Act and said Rules.

58. Criminals are prohibited from bidding

Any bidders having **criminal record** is not allowed to participate in the bidding process. Any person who is having criminal cases against him or involved in the **organized crime or gangster activities or Mafia or Goonda or Anti social activity** are strictly prohibited to participate in the bidding process. If it is established that any bidder has **criminal record**, his bid shall be automatically cancelled.

The bidder has to produced character certificate, Solvency certificate, self declared affidavit (on the prescribed Performa which is attached with the bid document) etc., issued by the competent authority in original with bid document.

59. Any bidder who is an Advocate and Registered with any State Bar Council Shall not be allowed to participate in the bidding. If it is established that the contractor is registered with the state bar council, his bid shall be automatically cancelled.

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Contract Data to General Conditions of Contract

Except where otherwise indicated, the Employer prior to issuance of the bidding documents should fill in all Contract Data. Schedules and reports to be provided by the Employer should be annexed

Clause Reference

Items marked "N/A" do not apply in this Contract.

1. The Employer is:
[Cl.1.1]
Designation: **Chief Executive officer, ASCL Agra**
E-mail ID: agrasmartcitylimited@gmail.com
2. The Intended Completion Date for the whole of the Works is **AS PER NIT** [Cl.1.1, 17&27] after start of work.
3. **The Site is located : Agra U.P.**
4. The Start Date shall be Same days after the date of issue of the Notice to [Cl.1.1] proceed with the work.
5. The works shall, inter-alia, include the following, as specified or as directed.

6.(a) Amount and deductible for insurance are:

[cl.13.1]

Item		Amount to be insured		Deductibles
A.	Loss of or damage to the works, Plants and materials	10 % of contract value		Deductibles for insurance shall be as per latest tariff of General Insurance Company of India plus 20% of premium amount for items A, B, C & D
B.	Loss of or damage to equipment	2.5 % of contract value		
C	Loss of or damage to property (except the works, plant, Materials, and Equipment) in Connection with the contract:	1 % of contract value		
D	Personal injury or death	Up to contract value Rs. 2 Crores	Rs. 2 lacs per occurrences for maximum three occurrences	
		For contract value more than Rs. 2 Crores	Rs. 2 lacs per occurrences for maximum three occurrences	

7.(a) Amount and deductible for insurance are:

cl.13.3(a)]

Item	Amount to be insured	Deductibles
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A.	Personal injury or death	Rs. 2 Lacs for one occurrence per year	Deductibles shall be as per latest tariff of General Insurance Company of India plus 20% of the premium amount
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14. Site investigation report
15. The key equipments/machinery for Electrical work shall be:
16. Competent authorities are:
17. (a) The period for submission of the program for approval of Engineer shall be TEN days from the issue of Letter of Acceptance.
- [CI.26.1]
- (b) The updated program shall be submitted at interval of 60 days.
- [CI. 26.3]
- (c) The amount to be withheld for late submission of an updated program shall be Rs. 10,000=00 per day for contract value up to 2 Crore and Rs. 20,000=00 per day for contract value above Rs. 2 Crores.
- [CI. 26.3]

19. No increase in rates of any items specified in Bill Of Quantity is allowed due to variation in quantities
- [CI 36.1]

20. The authorized person to make payments is CEO, Agra Smart City Limited, Agra.
- [CI 39.2]

21. (a) Milestone to be achieved during the contract period.
- 1/8th of the value of entire contract work up to 1/4th of the period allowed for completion of Electrical work.
 - 3/8th of the value of entire contract work up to 1/2nd of the period allowed for completion of Electrical work.
 - 3/4th of the value of entire contract work up to 3/4th of the period allowed for completion of Electrical work.

Amount of liquidated damages for delay in completion of works	For whole of work 1 percent of the initial contract price, rounded off to the nearest thousand, per week
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Maximum limit of liquidated damages for delay in completion of work.	10 percent of the initial contract price rounded off to the nearest thousand
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22. The standard form of performance security acceptable to the employer shall be an unconditional Bank Guarantee of the type as presented in the Bidding Documents.
- [CI 44.10]

23. (a) The Schedule of operating and maintenance manuals N.A
- [CI 51.1]
- (b) The date by which "as-built" drawings (in scale as directed) in 2 sets are required is within 28 days of issue of certificate of completion of whole or section of the work.
- [CI 51.1]

[CI 51.1]

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24. The amount to be withheld for failing to supply "as-built" drawings by the date required is Rs. 01 Lac. [CI 51.2]

(b) The following events shall be fundamental breach of contract: "The Contractor has contravened Clause 7.1 and Clause 9 Of Part I General Condition Of Contract"

26. The Percentage to apply to the value of the work not completed representing the Employer's additional cost for the completing the works shall be 20% [CI 51.2.(j)]

[CI 53.1]

Section- 4.
Conditions of Contract
Part – II Special Conditions of Contract

1. All the works shall be carried out as per specifications/PWD Electrical/Indian Electrical Standards detailed specification and instruction of Engineer-in-charge
2. The quantities are liable to vary on either side to any extent as per actual requirement of work for which no claim whatsoever by the contractor shall be entertained.
3. Any recovery imposed by Technical Audit cell or by higher authority will be deducted from contractors running final bills during execution of works and will be adjusted from performance security if final bill is processed during defect liability period.
4. All the defects appeared' during execution of work will have to be rectified as directed by Engineer in charge within shortest possible time. During defect liability period contractor will be deploy sufficient technical staff as mention in contract document for, proper maintenance of work. If contractor fails to attend the defects. Within reasonable time period, the same will be attended by department and all expenses so incurred will be adjusted from performance security of contractors.
5. The contractor will adopt PERT to complete the project in time. A detailed program and weekly working program will have to be submitted by contractor regularly.
6. For earth work, each borrow pit will have get to be approved from competent authority by furnishing all physical/chemical characteristic of earth of each borrow pit before start of work. The contractors are advised to survey the area to ascertain the availability of earth before tendering.
7. Project Management Consultancy:

OBJECTIVE The objective of this Consultancy (the "Objective") is to assist the ASCL in implementation of the Project till the successful completion and handing over of all works to the ASCL and comprehensively supervise the works and activities carried out by the Bidder(s) as Engineer's Representative" under the respective contract(s) in a manner that would ensure:

- a. Total compliance of technical specifications and various other requirements contained in the respective contracts by the Bidder(s);
- b. High standards of quality assurance system in the Consultancy as well as the works and activities of the Bidder(s);
- c. Comprehensive and documented reporting to the ASCL of Consultant's own activities, progress of the Project(s) and compliances/ non-compliances by the Bidder(s);
- e. Proper verification of measurements and bills submitted by the Bidder(s) so that payments made by the ASCL against these bills truly reflect the actual work done at site complying with the requirements of the respective contract(s);



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- f. proper interface and coordination among the ASCL, Bidder(s), other Bidders/ Bidders and local bodies/ state government; and
- g. Full documentation of the completed works including applications for various approvals.

The objectives of the PMC is not limited to the above, CEO of ASCL have discretion implement other objectives or the completion of the project.



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8. Security Deposit

In the event of the contractor failing or neglecting to complete rectification work within the period up to which the contractor has agreed to maintain the work in good order, then, subject to provisions of clause 17 and 20 hereof the amount of security deposit retained by ASCL shall be forfeited without any notice.

9. Compensation for delay

The time allowed to carry out the work as entered in the **Contract** shall be strictly observed by the contractor and shall be reckoned from the date on which the order to commence work is given to the Contractor. The work shall through the stipulated period of the contract be proceeded with, all due diligence (time being deemed to be of the essence of the contract on the part of the Contractor) and the Contractor shall pay as compensation an amount equal to one percent or such smaller amount as the Chief Executive Officer ASCL (whose decision in writing shall be final) may decide of the amount of estimated cost of the whole work as shown by the tenderer of everyday the work remains uncommenced or unfinished after the proper dates.

And further to ensure good progress during execution of the work, the contractor shall be bound, in all cases in which the time allowed for any work exceeds one month to complete.

¼ of the working 1/3 of the time

¼ of the working ½ of the time

¼ ¾ of the working

¼ ¾ of the time

And full work should be completed in (03 Calendar months)


In the event of the Contractor failing to comply with these conditions he shall be liable to pay as compensation, an amount an equal to one percent or such smaller amounts as the Chief Executive Officer ASCL (whose decision in shall be final) may decide of the said estimated cost of the whole work for everyday that the due quantity of work remains incomplete provided always that the total amount of compensation to be paid under the provisions of this clause shall not exceed 10 percent of the estimated cost of the work as shown in the tender. Chief Executive Officer, ASCL, should be the final authority in the respect.

10. Additional Action when whole of security Deposit is forfeited

In any case in which under any clause of this contract the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit whether paid in one sum or deducted by the instalments or in the case of abandonment of the work owing to serious illness or death of the Contractor or any other cause the Project Engineer, on behalf of the Corporation, shall have the power to adopt any of the following courses, as he may deem best suited to the interest of the Corporation.

- (a) To rescind the contract (for which rescission notice in writing to the Contractor under the hand of Project Engineer shall be conclusive evidence) and in that case the security deposit of the Contractor shall stand forfeited and be absolutely at the disposal of the Corporation.




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Agra Smart City Limited

- (b) To carry out the work or any part of the work departmentally debiting the Contractor with the cost of the work, expenditure incurred on the tools and plant, and charges on additional supervisory staff including the cost of the work—charged establishment employed for getting the un-executed part of the work completed and crediting him with the value of the work done departmentally in all respect in the same manner and at the same rates as if it had been carried out by the Contractor under terms of his contract. The certificate of the Project Engineer as to the costs and other allied expense so incurred and as to the value of the work so done departmentally shall be final and conclusive against the Contractor
- (c) i) To order that the work of the Contractor be measured up and to take such part thereof as shall be un-executed out of his hands, and to give it to another Contractor to complete, in which case all expenses incurred on advertisement for fixing a new contracting agency ,additional supervisory staff including the cost of the work charged establishment and the cost of the work executed by the new Contractor agency will be debited to the Contractor and the value of the work done or executed through the new Contractor in all respects and in the same manner and at the same rates as if it had been carried out by the Contractor under the terms of his contract. The certificate of the Project Engineer as to the costs and other allied expense so incurred and as to the value of the work so done departmentally shall be final and conclusive against the contractor.
- ii) In case the contract shall be rescinded under clause (a) above the Contractor shall not be entitled to recover or be paid, any sum for any work thereof actually performed by him under this contract unless and until the Project Engineer shall have certified in writing the performance of the such work and the amount payable to him in respect thereof and he shall only be entitled to be paid the amount so certified. In the event of either of courses referred to clause (b) or (c) being adopted and the cost of the work executed departmentally or through new contractor and other allied expense exceeding the value of such work credited to the Contractor the amount of excess shall be deducted from any money due to the Contractor, by Corporation under the contractor or otherwise howsoever or from his security deposit or the sale proceeds thereof provided; however that Contractor shall have no claim against Corporation even if the certified value of the work done departmentally or through a new Contractor exceeds the certified cost of such work and allied expenses, provided always that whichever of the three courses mentioned in clause (a), (b) or (c) is adopted by the Chief Executive Officer ASCL, the Contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials, or entered into any engagements, or made any advance on account of or with a view to the execution of the work or the performance of the contract.

11. Action when the progress of any particular portion of the work is unsatisfactory

If the progress of any particular portion of the work is unsatisfactory, the Chief Executive Officer ASCL shall notwithstanding that the general progress of the work is in accordance with the conditions mentioned in clause 2 be entitled to take action under clause 3 (b) after giving the Contractor 10 days' notice in working. The contractor will have no claim for compensation, for any loss sustained by him owing to such action.

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12. Contractor remains liable to pay compensation if action not taken under clause 3 and 4

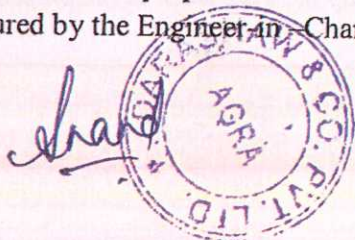
In any case in which any of the powers conferred upon the Project Engineer by clause 3 and 4 shall have become exercisable and the same shall not have been exercised the non-exercise thereof shall not constitute a waiving of any of the condition here of the such power shall notwithstanding be exercisable in the event of any future case of default by the Contractor for which under any clause hereof he is declared liable to pay compensation amounting to the whole of his security deposit and the liability of the Contractor for past and future compensation shall remain unaffected. In the event of the Project Engineer taking action under sub-clause (a) or (c) of clause 3, he may, if he so desires, take possession of all or any tools and plant, materials and stores in or upon the work of the site thereof belonging to the Contractor, or procured by him and intended to be used for the execution of the work or any part thereof, paying or allowing for the same in account at the contract rates, or in the case of contract rates not being applicable at current market rates to be certified by the Project Engineer whose certificate thereof shall be final. In the alternative, the Project Engineer may, after giving notice in writing to the Contractor or his clerk of any work, foreman or other authorized agent required him to remove such tools and plant, materials, or stores from the premises within a time to be specified in such notice, and in the event of the Contractor failing to comply with any such requisition, the Project Engineer may remove them at the Contractor's expenses or sell them by auction or private sale on account of the Contractor and at his risk in all respects, and the certificate of Project Engineer as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the Contractor

13. Extension of time limit

If the Contractor shall desire an extension of the time for completion of work on the ground of his having been unavoidably hindered in its execution or on any other ground he shall apply in writing to the Project Engineer before the expiration of the period stipulated in the tender or before the expiration of 30 days from the date on which he was hindered as aforesaid or on which the clause for asking for extension occurred, whichever is earlier and the Project Engineer, or in the opinion of Project Engineer as the case may be if in his opinion, there were reasonable ground for granting an extension, grant such extension as he thinks necessary or proper, the decision of the Chief Executive Officer ASCL in this matter shall be final.

14. Final Certificate

On the completion of the work the Contractor shall be furnished with a certificate by the Project Engineer (hereinafter called the Engineer-in-Charge) of such completion; but no such certificate shall be given nor shall the work be considered to be complete until the Contractor shall have removed from the premises on which the work shall have been executed, all scaffolding, surplus materials and rubbish, and shall have cleaned off, the dirt from all wood work, doors, windows, wall, floor or other parts of any building in or upon which the work has been executed, or of which he may have had possession for the purpose of executing the work, nor until the work shall have been measured by the Engineer-in-Charge or where the measurements have been



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taken by his subordinates until they have received approval of the Engineer-in-Charge, the said measurements being binding and conclusive against Contractor. If the contractor shall fail to comply with the requirements of this clause as to the removal of scaffolding surplus materials and rubbish and cleaning of dirt on or before the date fixed for the completion of the work the Engineer-in-Charge may at the expense of the Contractor, removal such scaffolding, surplus material and rubbish, and dispose of the same as he thinks fit and clean off as such dirt as aforesaid and the Contractor shall from with pay the amount of the all expenses so incurred, but shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof

15. Payment on intermediate certificate to be regarded as advances


No payment shall be made for any work, estimated to cost less than rupees one thousand till after the whole of work shall have been completed and a certificate of completion given. But in the case of works estimated to cost more than rupees one thousand the Contractor shall on submitting a monthly bill therefore be entitled to receive payment proportionate to the part of the work than approved and passed by the Engineer-in-Charge, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the Contractor. All such intermediate payments shall be regarded as payment by way of advance against the final payment only and not as payment for work actually done and completed and shall not preclude the Engineer-in-Charge from requiring any bad, unsound imperfect or unskillful work to be removed or taken away and reconstructed, or re-erected nor shall any such payment be considered as an admission of the due performance of the contract or any part thereof in any respect or the occurring of any claim nor shall it conclude, determine or effect in any other way powers of the Engineer-in-Charge as to the final settlement and adjustment of the accounts or otherwise, or in any other way vary or effect the contract. The final bill shall be submitted by the Contractor within one month of the date fixed for the completion of the work, otherwise the Engineer-in-Charge's certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties

16. Payment on reduced rates on account of items of work not accepted as completion discretion of Engineer-in-Charge


The rates of several items of work estimated to cost more than Rs. 1000/- agreed to within, shall be valid only when the item concerned is accepted as having been completed fully in accordance with the sanctioned specifications. In case where the item of work are not accepted as so completed by the Engineer-in-Charge may make payment on account of such item at such reduced rates as he may consider reasonable in the preparation of final or on account bills.

17. Bill to be submitted

A bill shall be submitted by the Contractor in each month on or before the date fixed by the Engineer-in-Charge for all work executed in the previous month and the Engineer-in-Charge shall take or cause to be taken the requisite measurement for the purpose of having the same verified and the claim, so far as it is admissible, shall be adjusted, if possible, within 10 days from the presentation of the bill. If the contractor does not submit the bill within the time fixed as aforesaid, the Engineer-in-Charge may depute a subordinate to measure up the said work in the presence of the


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contractor or his duly authorized agent whose counter signature to the measurement list shall be sufficient warrant, and the Engineer-in-Charge may prepare a bill from such a list which shall be binding on the contractor in all respects.

18. Bill to be on printed forms

The contractor shall submit all bills on the printed forms to be had in the application at the office of the Engineer-in-Charge. The charges to be made in the bill shall always be entered at the rates specified in the tender or in the case of any extra work ordered in pursuance of these conditions, and not mentioned or provided for in the tender at the rates hereinafter provided for such work.

19. Stores supplied by ASCL

If the specification or estimate of the work provides for the use of any special description of materials to be supplied from the store of the Engineering departmental store or if it is required that the contractor shall use certain stores to be provided by the Engineer in charge or General manager (such materials and stores and the prices to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the contractor but not so far as in any way to control the meaning or effect to this contract specified in the schedule or memorandum hereto annexed) the contractor shall be supplied with such materials and stored as may be required from time to time to be used only by him for the purpose of the contract only, and the value of the full quantity of the materials and stores so supplied shall be set off or deducted from any sums then due, or thereafter to become due to contractor under the contract, or otherwise, or from the security deposit or the proceeds of the sale thereof if the security deposit is held in pledged securities, the same or a sufficient portion thereof shall in that case be sold for the purpose. All materials supplied to the contractor shall remain the absolute property of Corporation and shall on no account be removed from the site of the work, and shall at all times be open for inspection by the engineer in charge. Any such materials unused and in perfectly good conditions at the time of completion or determination of the contract shall be returned by the engineering departmental store if the engineer in charge so requires by a notice in writing given under his hand but the contractor shall not be entitled to return any such materials except with consent of the Engineer in charge and shall have no claim for compensation on account of any such material supplied to him as foresaid but remaining unused by him or any wastage in or damage to any such materials

All stores of controlled materials such assessment; steel etc., supplied to the contractor by the ASCL should be kept by the contractor under lock and key and will be accessible for inspection by the Project Engineer or his agents all the time.

20. Work to be executed in accordance to specifications, drawings, orders etc.

The contractor shall execute whole and every part of the work in the most substantial and workman like manner, and both as regards materials and every other respect in strict accordance with specifications. The contractor shall also conform exactly, fully, and faithfully to the designs, drawings and instructions in writing relating to the work signed by the Engineer-in-Charge and lodged in his office and to which the contractor shall be entitled to have access for the purpose of inspection at such office, or at the site of the work during office hours. The contractor will be entitled to receive three sets of contract drawings and working drawing as well as one certified copy of the accepted tender along with work order free of cost. Further copies of the contract



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drawings and working drawings if required by him, shall be supplied at the rate of Rs.200/- per set of contract drawings and Rs.100/- per working drawing except where otherwise specified

21. Alterations in specifications and designs not invalidate

The Engineer-in-Charge shall have the power to make any alterations in or additions to original specifications, drawings, designs, and the instructions that may appear to him to be necessary or advisable during the progress of the work, and the contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in the writing signed by the Engineer-in-Charge and such alterations shall not invalidate the contract, and any additional work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work, and if the additional and altered work includes any class of work for which no rate is specified in the contract, then such work or class shall be carried out at the rates entered in the Schedule of rates of the Government or the Corporation or at the rates mutually agreed upon between the Engineer-in-Charge or altered work for which no rate is entered in the rates agreed upon then the contractor shall within seven days of the date of receipt by him the order to carry out the work, inform the Engineer-in-Charge of the rate which it is his intention to charge for such class of work, and if the Engineer-in-Charge does not agree to this rate he shall by notice in writing be at liberty to cancel his order to carry out such class of work and arrange to carry out in such manner as he may consider advisable provided always that if the contractor shall commence work or incurred any expenditure in regard thereto before the rates shall have been determined as lastly herein before mentioned, then in such case he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer-in-Charge in the event of a dispute, the decision of the Chief Engineer will be final.

Where, however, the work is to be executed according to the designs, drawings and specifications recommended by the contractor and accepted by the competent authority the alterations above referred to shall be within the scope of such designs, drawings and specifications appended to the tender.

The time limit for the completion of the work shall be extended in the proportion that the increase in its cost occasioned by alterations, or additions bears to the cost of the original contract work, and the certificate of the Engineer-in-Charge as to such proportion shall be conclusive

22. Extension of time in consequence of additions or alterations

- 1) If at any time after the execution of the contract documents the Engineer shall for any reason whatsoever (other than default on the part of the contractor for which the Corporation is entitled to rescind the contract) desires that the whole or the part of the work specified in the tender should be suspended for any period or that the whole or part of the work should not be carried out, at all he shall give to the contractor a notice in writing of such desire and upon the receipt of such notice the contractor shall forthwith suspend or stop the work wholly or in part as required, after having due regard to the appropriate stage at which the work should be stopped or suspended so as not to cause any damage or injury to the work already

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done or endanger the safety thereof provided that the design of the Engineer as to the stage at which the work or any part of it could be or could have been safely stopped or suspended shall be final and conclusive against the contractor. The contractor shall have no claim to any payment or compensation whatsoever by reason of or suspension, stoppage or curtailment except to the extent specified therein after.

2) Where the total suspension of work ordered as aforesaid continued for a continuous period exceeding 90 days the contractor shall be at liberty to withdraw from the contractual obligations under the contract so far as it pertains to the unexecuted part of the work by giving a 10 days prior notice in writing to the Engineer, within 30 days of the expiry of the said period of 90 days, of such intention and requiring the Engineer to record the final measurements of the work already done to pay the final bill. Upon giving such notice the contractor shall be deemed to have been discharged from his obligation to complete the remaining un-executed work under his contract. On receipt of such notice the Engineer shall proceed to complete the measurement and make such payment as may be finally due to the contractor within the period of 90 days from the receipt of such notice in respect of the work already done by the contractor. Such payment shall not in any manner prejudice the right of the contractor to any further compensation under the remaining provisions of this clause

3) Where the Engineer required the contractor to suspend the work for a period in excess of 30 days at any time or 60 days in the aggregate, the contractor shall be entitled to apply to the Engineer within 30 days of the resumption of the work after such suspension for payment of compensation to the extent of pecuniary loss suffered by him in respect of working machinery remained idle on the site or on the account of his having and to pay the salary or wages of labor engaged by him during the said period of suspension provided always that the contract shall be not entitled to any claim in respect of any working machinery, salary or wages for the first 30 days whether consecutive or in the aggregate or such suspension in respect of any suspension whatsoever occasioned by unsatisfactory work or any other default on his part. The decision of the Engineer in this regard shall be final and conclusive against the contractor.

(4) In the event of-

(i) Any total stoppage of work on notice from the Engineer under Sub clause (1) in that behalf.

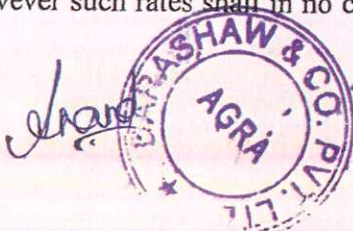
(ii) Withdrawal from the contractor from the contractual obligation completes the remaining un-expected work under the sub-clause (2) on account of continued suspension of work for a period exceeding 90 days

Curtailment in the quantity of item or items originally tendered on account of any alteration, omission on substitution in the specification, drawings, designs, or instructions under clause 15(1) where such curtailment exceeds 25 % in quantity and the value of quantity curtailed beyond 25 % at the rates for the items specified in the tender is more than Rs.50000/-It shall be open to the contractor, within 90 days from the service of (i) the notice of stoppage of work or (ii) the notice of withdrawal from the contractual obligations under the contract on account of continued suspension of work or (iii) notice under clause 15(1) resulting in such curtailment, to produce to the Engineer satisfactory documentary evidence that he had purchased or agreed to purchase material for use in the contracted work, before receipt by him of the notice of stoppage, suspension or curtailment and require the Corporation to take over on payment such material at the rates determined by the Engineer, provided, however such rates shall in no case exceed the rates at which the same was required

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by the contractor. The contractor shall thereafter take over the materials so offered, provided the quantities offered, are not in excess of the requirements of the unexecuted work as specified in the accepted tender and are of quality and specifications approved by the Engineer

The contractor shall not be entitled to claim any compensation from the Corporation for the loss suffered by him on account of delay by Corporation in the supply of materials entered in Schedule „A“ where such delay is caused by-

- (i) Difficulties related to the supply of railway wagons,
- (ii) Force Majeure,
- (iii) Act of God,
- (iv) Act of enemies of the State or any other reasonable cause beyond the control of Corporation.

In the case of such delay in the supply of materials, Corporation shall grant such extension of time for the completion of the works as shall appear to the Project Engineer to be reasonable in accordance with the circumstances of the case. The contractor shall accept the decision of the Project Engineer as to the extension of time as final

23. Time limit for unforeseen claims

Under no circumstances whatever shall the contractor be entitled to any compensation from the Corporation on any account unless the contractor shall have submitted a claim in writing to the Engineer- in- Charge within one month of the case of such claim occurring

24. Action and compensation payable in case of bad work

If any time before the security deposit or any part thereof is refunded to the contractor, it shall appear to the Engineer-in- Charge or his subordinate in charge of work, that any work has been executed with unsound, imperfect or unskillful workmanship or with the materials of inferior quality, or that any materials or articles provided by him for the execution of the work are unsound, or of a quality inferior to that contracted for or are otherwise not in accordance with the contract it shall be lawful for the Engineer-in-Charge to intimate this fact in writing to the contractor and then notwithstanding the fact that the work, materials or articles complained of any have been inadvertently passed, certified and paid for the contractor shall be bound forthwith, to rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require, or if so required, shall remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost, and in the event of his failing to do so, within a period to be specified by the Engineer- in- Charge in the written intimation aforesaid, the contractor shall be liable to pay compensation at the rate of 1 % on the amount of the estimate for every day not exceeding 10 days during which the failure so continues and in the case of any such failure the Engineer- in-Charge may rectify and remove, and re-execute the work or remove and replace the material or articles complained of as the case may be at the risk and expense in all respects of the contractor. Should the Engineer- in- Charge consider that no such inferior work or materials as described above maybe accepted or made use of it shall be within his discretion to accept the same at such reduced rates as he may fix therefore

Work to be open for Contractor or responsible agent to be present

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All work under or in course of execution or executed in pursuance of the contract shall at all times be open to the inspection and supervision of the Engineer-in-Charge and his subordinates, and the contractor shall at all times during the usual working hours, and at all other times at which his subordinates to visit the work shall have been given to the contractor, either himself be present to receive orders and instructions or have responsible agent duly authorized in writing present for that purpose. Orders given to the contractors duly authorized agent shall be considered to have the same force and affect as if they had been given to the contractor himself.

26. Notice to be given before work is covered up

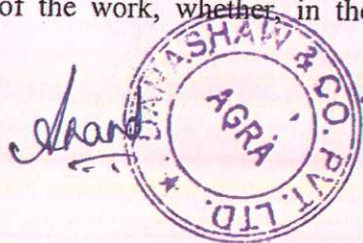
The Contractor shall give not less than 5 days' notice in writing to the Engineer-in-Charge or his subordinate in charge of the work before measurement any work in order that the same may be measured and correct dimensions thereof taken before the same is so covered up or place beyond the reach of measurement and shall not cover up or place beyond the reach of measurement any work without the consent in writing of Engineer-in-Charge or his subordinate in charge of the work and if any work shall be covered up or placed beyond the reach of measurement, without such notice having been given or consent obtained the same shall be uncovered at the contractors expense and in default thereof no payment or allowance shall be made for such work or for the materials with which the same was executed

27. Contractor liable for damage done

If during the period of 12 months from the date of completion as certified by the Engineer-in-Charge pursuant to Clause 7 of the contract for 12 months after commissioning the work, whichever is earlier in the opinion of the Project Engineer, said work is defective in any manner whatsoever, the contractor shall forthwith on receipt of notice in that behalf from the Project Engineer, duly commence execution and completely carry out at his cost in every respect or the work that may be necessary for rectifying and setting right the defects specified therein including dismantling and reconstruction of unsafe portion strictly in accordance with and in the manner prescribed and under the supervision of the Project Engineer. In the event of the contractor failing or neglecting to commence execution of the said rectification work within the period prescribed thereof in the said notice and/or to complete the same as aforesaid as required by the said notice, the Project Engineer shall get the same executed and carried out departmentally or by any other agency at the risk on account and at the cost of the contractor. The contractor shall forthwith on demand pay to the ASCL the amount of such cost, charges and expenses sustained or incurred by the ASCL of which the certificate of the Project Engineer shall be final and binding on the contractor. Such cost, charges and expenses shall be deemed to be arrears of land revenue and in the event of the contractor failing or neglecting to pay the same on demand as aforesaid without prejudice to any other rights and aforesaid remedies of the corporation the same may be recovered from the contractor as arrears of land revenue. The ASCL shall also be entitled to deduct the same from any amount, which may then be payable or which may thereafter become payable by the ASCL to the contractor either in respect of the said work or any other work whatsoever or from the amount of security deposit retained by Corporation

28. Contractor to supply, Plant, Ladder etc.

The contractor shall supply at his own cost all materials (except such special material, if any as many in accordance with the contract, be supplied from the Engineering Departmental Stores), plant tools appliances implements, ladders, cordage, tackle scaffolding and temporary works requisite or proper for the proper execution of the work, whether in the original, altered or substituted from and



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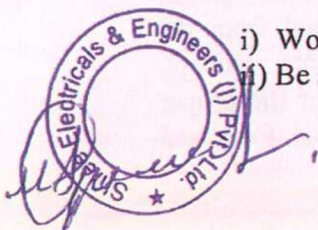
whether including in the specification or other documents forming part of the contract or referred to in these conditions or not and which may be necessary for the purpose of satisfying or complying with the requirement of the Engineer-in-Charge as to any matter as to which these conditions, he is entitled to be satisfied, or which he is entitled to require together with the carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of setting out works and counting, weighing and assisting in the measurement or examination at any time and from time to time of the work or the material, failing which the same may be provided by the Engineer-in-Charge at the expenses of the contractor and the expenses may be deducted from any money due to the contractor under the contract or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof. The contractor shall provide all necessary fencing and lights required to protect the public from accidents, and shall also be bound to bare the expenses of defense of every suit, action or other legal proceedings, that may be brought by any person for injuries sustained obeying to neglect of the above precautions, and to pay any damages and costs which may be avoided in any such suit actions or proceedings to any such person, or which may with consent of the contractor to be paid for compromising any claim by any such person.

29. List of machinery in contractor's possession and which they propose to use on the work should be submitted along with the tender

The contractor shall provide suitable scaffolds and working platforms gangways and stairways and shall comply with the following regulations in connection therewith

- a) Suitable scaffolds shall be provided for workmen for all works that cannot be safely done from a ladder or by other means
- b) A scaffold shall not be constructed, taken down or substantially altered except-
 - i) Under the supervision of a competent and responsible person: and
 - ii) As far as possible by competent workers possessing adequate experience in this kind of work
- c) All scaffolds and appliances connected therewith and ladders shall-
 - i) Be sound of material,
 - ii) Be of adequate strength having regards to the loads and strains to which they will be subjects, and
 - iii) Be maintained in proper condition
- d) Scaffolds shall be so constructed that no part thereof can be displaced in consequence of normal use
- e) Scaffolds shall not be overloaded and so far as practicable the load shall be evenly distributed
- f) Before installing lifting gear on scaffolds special precautions shall be taken to ensure the strength and stability of the Scaffolds
- g) Scaffolds shall be periodically inspected by a competent person
- h) Before allowing a scaffold to be used by his workmen the contractor shall, whether the scaffold has been erected by his workmen or not, take steps to ensure that it complies fully with the regulation herein in specified.

- i) Working platform, gangways, stairways shall
- ii) Be so constructed that no part of thereof can sag unduly or unequally.



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- iii) Be so constructed and maintained having regard to the prevailing conditions as to reduce as far as practicable risks of persons tripping or slipping, and
- i) Be kept free from any unnecessary obstruction
- j) In case of working platform, gangway, working places and stairways at a height exceeding three Members. Every working platform and every gangway shall be closely boarded unless other adequate measures are taken to ensure safety.
- i) Every working platform and gangway shall have adequate width and
- ii) Every working platform, gangway, working place and stairway shall be suitable fenced.
- k) Every opening in the floor of a building or in a working platform shall accept for the time and to the extent required to allow the excess of persons for the transport for shifting of materials to be provided with suitable means to prevent the fall of persons or materials
- l) When persons are employed on roof where there is a danger of falling from a height exceeding 3 meters. Suitable precautions shall be taken to prevent the fall of persons or material
- m) Suitable precautions shall be taken to prevent persons being struck by articles, which might fall from scaffolds or other working places
- n) Safe means of access shall be provided to all working platforms and other working places

The contractor(s) will have to make payments to the laborers as per minimum wages Act

The contractor shall comply with the following regulations as regards the hoisting appliances to be used by him.

- (a) Hoisting machine and tackle, including the attachments anchorages and supports shall,
 - (i) Be of good mechanical construction, sound material and adequate strength and free from patent defect and
 - (ii) Be kept in good repair and in working order.
- (b) Every rope used in hoisting or lowering materials or as a mean of suspension shall be of suitable quality and adequate strength and free from patent defect.
- (c) Hoisting machines and tackle shall be examined and adequately tested after erection on the site and before used and be re examined in position at intervals to be prescribed by the Corporation.
- (d) Every chain, ring, hook, shackle swivel and pulley block used in hoisting and lowering materials or as a mean of suspension shall be periodically examined.
- (e) Every crane driver or hoisting appliance operator shall be properly qualified.
- (f) No person who is below the age of 18 years shall be control of any hoisting machine, including any scaffold which, or give signals to the operator.
- (g) In case of every hoisting machine and of every chain, ring, hook, shackle, swivel pulley block used in hoisting or lowering or as a mean of suspension, the safe working load shall be as ascertained by adequate means.



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- (h) Every hoisting machine and all gear referred to in preceding regulation shall be plainly marked with the safe working load.
- (i) In the case of a hoisting machine having a variable safe working load each safe working load and the condition under which it is applicable shall be clearly indicated.
- (j) No part of any hoisting machine or of any geared referred to in regulation (g) above shall be loaded beyond the safe working load except for the purpose of testing.
- (k) Motors, gearing transmissions, electric wiring and other dangerous part of hoisting appliances shall be provided with efficient safeguards.
- (l) Hoisting appliances shall be provided with such means as will reduce to minimum, and the risk of the accidental descent of a load
- Adequate precautions shall be taken to reduce to a minimum the risk of any part of a suspended load becoming accidentally displaced.

30. Measure for prevention of fire

The contractor shall not set fire to any standing jungle, trees, bush woods or grass without a written permit from the Project Engineer.

When such permit is given, and also in all cases when destroying cut or dug up trees bush wood, grass etc. by fire; the contractor shall take necessary measure to prevent such fire spreading to or otherwise damaging surrounding property.

The contractor shall make his own arrangements for drinking water for the labors employed by him.

31. Liability of contractor for any damage done in or outside work

Compensation for all damages done intentionally or unintentionally by the contractor's labor whether in or beyond the limits of Corporation property including any damage caused by the spreading of fire mentioned in Clause 22 shall be estimated by the Engineer-in-Charge or such other officer as he may appoint and the estimate of the Engineer in charge subject to the decision of the Chief Executive Officer on appeal shall be final and the contractor shall be bound to pay the amount of the assessed compensation on demand, failing which, the same will be recovered from the contractor as damages in the manner prescribed in Clause 1 or deducted by the Engineer-in-Charge from any sums that may be due or become due from Corporation to the contractor under this contract or otherwise. The contractor shall bear the expenses of defending any section or other legal proceedings that may be brought by any persons for injury sustained by him owing to neglect of precautions to prevent the spread of fire and he shall pay any damages and cause that may be awarded by the court in consequences

32. Employment of female labor

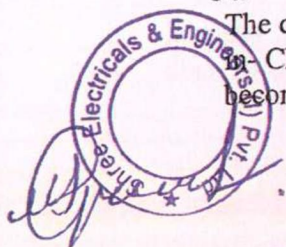
The employment of female labors on works in neighborhood of soldier's barracks should be avoided as far as possible. The contractor shall employ the labor with the nearest employment exchange

33. Work of Sunday

No work shall be done on a Sunday without the sanction in writing of the Engineer-in-Charge.

34. Work not to sublet

The contract shall not be assigned or sublet without the written approval of the Engineer-in-Charge and if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any proceeding to get himself adjudicated and insolvent



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or make any composition with his creditors, or attempt to do so or if bribe, gratuity, gift, loan, perquisites, reward or advantage pecuniary or otherwise, shall either directly or indirectly be given, promise or offered by the contractor or any of his servants or agents to any public officer or person in the employ of corporation in any way relating to his office or employment, or if in any such officer or person shall become in anyway directly or indirectly interested in the contract the Engineer-in -Charge may there upon by notice in written rescind the contract and the security deposit of the contractor shall thereupon stand forfeited and be absolutely at the disposal of Corporation and the same consequences shall ensure as if the contract had been rescinded under Clause 3 hereof and in addition the contractor shall not be entitled to recover or be paid for any work therefore actually performed under the contract

35. Sum payable by way of compensation to be considered reasonable compensation without reference to actual loss

All sums payable by contractor by way of compensation under any of these conditions shall be considered as a reasonable compensation to be applied to the use of Corporation without reference to the actual loss or damage sustained, and whether any damage has or has not been sustained

36. Changes in constitution of firm to

In case of tender by partners, any changes in the constitution of a firm shall be forthwith notified by the contractor to the Engineer- in- Charge for his information

37. Direction and control of Chief Executive Officer ASCL

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Project Engineer for the time being, who shall be entitled to direct at what points and in what manner they are to be commenced and from time to time carried on

- (1) Except where otherwise specified in the contract and subject to the powers delegated to him by Corporation the decision of the Project Engineer for the time being shall be final, conclusive, and binding all parties to the contract upon all questions relating to the meaning of all specifications, designs, drawings and instructions hereinbefore mentioned and as to the quality of workmanship or materials used on the work, or as to any other question, claim, right matter, or thing whatsoever, if any way arising out of, or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions, or otherwise concerning the works or the execution, or failure to execute the same, whether arising during the progress of the work, or after the completion or abandonment thereof.

- (2) The contractor may within thirty days of receipt by him of any order passed by the Project Engineer as aforesaid appeal against it to the ASCL concerned with the contract,

work or Project provided that-

The accepted value of that contract exceeds Rs. 10.00 lakhs (Rs. Ten lakhs Amount of claim is not less than Rs. 1.00 lakh (Rs. One lakh)



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If the contractor is not satisfied with the order passed by the Chief Executive Officer, ASCL as aforesaid, the contractor may within thirty days of receipt by him of any such order Appeal against it to the Commissioner, and the Decision given by the Commissioner will be final.

38. Lump sums in estimates

When the estimate on which a tender is made includes lump sums in respect of parts of the work the contractor shall be entitled to payment in respect of the items of work involved or the part of work in question at the same rates as are payable under this contract of each item, or if the part of work in question is not in the option of the engineer in charge capable of measurement, the Engineer- in-Charge may as his discretion pay the lump sum amount entered in the estimate and the certificate in writing of the Engineer- in-Charge shall be final and conclusive against the contractor with regard to any sum or sums payable to him under the provision of this clause

39. Actions where no specifications

In the case of any class of work for which there is no such specification as is mentioned in rule 1 such work shall be carried out in accordance with the standard specifications of Public Works Department, and in the event of there being no specification, then in case the work shall be carried out in all respects in accordance with all instructions and requirements of the Engineer- in-Charge

40. Definition of work

The expression "works" or "work" where used in these conditions, shall unless there by something in the subject or context repugnant to such Electrical work be construct to mean the work or works contracted to be executed under or in virtue of the contract, whether temporary or permanent and whether original, altered substituted or additional

The percentage referred to in the tender shall be deducted from/ added to the gross of the bill before deducting the value of any stock issued

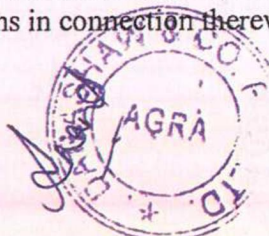
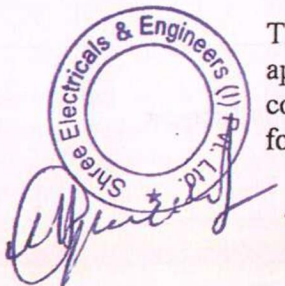
: All quarry fees, royalties and ground rent for stacking materials if any should be paid by the contractor

The contractor shall be responsible for and shall pay any compensation to his workmen payable under the Workmen's Compensation Act 1923 (VIII of 1923) (hereinafter called the said Act) for injuries caused to the workmen. If such compensation is payable paid by corporation as principal under sub section (1) of section 12 of the said Act on behalf of the contractor under subsection (2) of the said section. Such compensation shall be recovered in the manner laid down in the Clause 1 above

the contractor shall be responsible for and shall at the expenses of providing medical aid to any workmen who may suffer a bodily injury as a result of an accident. If Corporation the same shall be recoverable from the contractor forthwith and be incurs such expenses deducted without prejudice to any other remedy of Corporation from any amount due or that may be due to the contractor

The contractor shall provide all necessary personal safety equipment's and first aid apparatus available for use of persons employed on site and shall maintain the same condition suitable for immediate use at any time and shall comply with the following regulations in connection therewith.

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- a) The workers shall be required to use the equipment so provide by the contractor shall take adequate steps to ensure proper use of the equipment by those concerned.
- b) When the work is carried in the proximity to any place where there is a risk or drawing all necessary equipment shall be provided and kept ready for use and all necessary steps shall be taken for the prompt rescue of any person in danger.
- c) Adequate provisions shall be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

The contractor shall duly comply with the provision of "the Apprentices Act" (III of 1961) the rules made there under and the orders that may be issued from time to time under the Act the said Rules

41. Claim for quantities entered in the tender

- (1) Quantities in respect of the several items shown in the tender rare approximate and no revision in the tendered rate shall be permitted in respect of any of the items so long as subject to any special provision contained in the specifications prescribing a different percentage of permissible variation the quantity of the item does not exceed the contract quantity by more than 50% and so long as the value of the excess quantity beyond this limit as the rate of the item specified in the tender is not more than Rs 5,00,000/- (Rs Five Lakh only).
- (2) The contractor shall if ordered in writing by the Engineer to do so, also carry out any quantities in excess of the limit mentioned in sub-clause (1) hereof on the same conditions as in accordance with the specifications in the tender and at the rates as mentioned below:
 - a) if tender rate is above, rate will be at par as per Current PWD SOR
 - b) If tender rate is below, rate will be as per tender quoted rate on Current PWD SOR. For the purpose of operation of this clause, the total cost shall be taken as derived from the PWD SOR.
- (3) Claims arising out of reduction in the tendered quantity of any item beyond 50 % will be governed by the provision of clause 15 only when the amount of such reduction beyond 50 % at the rate of the item specified in the tender is more than Rs.5,00,000/- (Rs Five Lakh only). This reduction is exclusively of the reduction mentioned in clause No 2, 1, 4 of the work and site condition.

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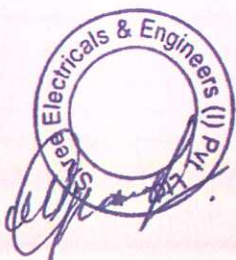
There is no change in the rate if excess is less than or equal to 50%. Also, there is no change in the rate if quantity of work done is more than 50 % of the tendered quantity or the value of the excess work at tendered rates does not exceed Rs. 5,00,000/- (Rs Five Lacks only)

42. Employment of famine labor etc

The contractor shall employ any famine, convict or other labor of a particular kind or class if ordered in writing to do so by the Engineer- in-Charge.

43. Claim for compensation for delay in starting the

No compensation shall be allowed for any delay caused in the starting of the work on account of acquisition of land or in the case of clearance works on account of any delay in according to sanction of estimates



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44. Claim for compensation for delay in execution

No compensation shall be allowed for any delay in the execution of the work on account of water standing in borrow pits or compartments the rates are inclusive for hard or cracked soil Excavation in mud, sub soil, water standing in borrow pits and no claim for an extra rate shall be entertained, unless otherwise expressly specified

45. Entering upon or commencing any portion of work

The contractor shall not enter upon or commence any portion of work except with the written authority and instructions of the Engineer- in-Charge or of his subordinate in charge of the work. Failing such authority, the contractor shall have no claim to ask for measurements of or payment for work

46. Minimum age of persons employed, the employment of donkeys and for other animals and payment of fair wages

- (i) No contractor shall employ any person who is under age of 18 Years.
- (ii) No contractor shall employ donkeys or other animals with breeching of string or thin rope the breeching must be at least three inches wide and should be of tape (Nawar).
- (iii) No animals suffering from sores lameness or emaciation or which is immature shall be employed on the work.
- (iv) The Engineer-in-Charge or his agent is authorized to remove from the work any person or animal found working which does not satisfy these conditions and no responsibility shall be accepted by ASCL for any delay caused in the completion of work by such removal.
- (v) The contractor shall pay fair and reasonable wages to the workmen employed by him in the contract under taken by him. In the event of any dispute arising between the contractor and his workmen on the grounds that the wages paid are not fair and reasonable, the dispute shall be referred without delay to the Project Engineer who shall decide the same. The decision of the Project Engineer shall be conclusive and binding on the contractor but such decisions shall not in any way affect the conditions of contract regarding the payment to be made by corporation at the sanctioned tender rates.
- (vi) The contractor shall provide drinking water facilities to the workers similar amenities shall be provided to the workers engaged on large work in urban areas.
- (vii) Contractor to take precaution against accidents which take place on account of labor using loose garments while working near machinery.

47. Method of payment

Payments to contractors shall be made by cheque drawn on any bank within the ASCL limits convenient not exceeding Rs 10 /- will be paid in cash.

48. Employment of scarcity labor

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If ASCL declares a state of scarcity or famine to exist in any village situated within 10 miles of the work, the contractor shall employ upon such parts of work, as are suitable for unskilled labor, any person certified to him by the Project Engineer, or be any person to whom the Project Engineer may have delegated this duty in writing to be in need of relief and shall be bound to pay to such person wages not below the minimum which government may have fixed in this behalf. Any disputes which may arise in connection with the implementation of this clause shall be decided by the Project Engineer whose decision shall be final and binding on the contractor

The contractor shall employ at least 80 percent of the total number of unskilled labor to be employed by him on the said work from out of the persons ordinarily residing in the district in which site of the said work is located. Provided, however; that if the required number of unskilled labor from that district is not available, the contractor shall in the first instance employ such number of persons as is available and thereafter may with previous permission in writing of the Project Engineer-in-charge of the said work, obtain the rest of the requirement of unskilled labor from outside district. Wages to be paid to the skilled and unskilled laborers engaged by the Contractor. The contractor shall pay the laborer's skilled and unskilled according to the wages prescribed by the Minimum Wages Act of 1948 applicable to the area in which the work of the contract is located.

The contractor shall comply with the provisions of the Apprentices Act 1961 and the rules and Orders issued there under from time to time, if he fails to do so, his failure will be a breach of the contract and the Project Engineer, may in his discretion, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provision of Act. The contractor shall pay the laborer's skilled and unskilled according to wages prescribed by Minimum Wages Act applicable to the area in which the work lies

The contractor shall duly comply with all the provisions of the Contract Labor (Regulation and Abolition) Act, 1970 (37 of 1970) as amended from time to time and all other relevant status and statutory provision concerning payment of wages particularly to workmen employed by the contractor and working on the site of the work. In particular, the contractor shall pay wages to each worker employed by him on the site of the work. If the contractor fails or neglect to pay wages at the said rates or makes short payment and the ASCL makes such payment of wages in full or part thereof less paid by the contractor, as the case may be, the amount so paid by the contractor to such workers shall be deemed to be arrears of land revenue and the corporation shall be entitled to recover the same as such from the contractor or deduct same from the amount payable by the corporation to the contractor hereunder or from any other amount payable by the ASCL to the contractor hereunder or from any other amounts Payable to him by the Corporation.

If the project is shelved by the Corporation before commencement, the contractor will have no right to claim any losses or compensation due to the same and for whatsoever reasons.

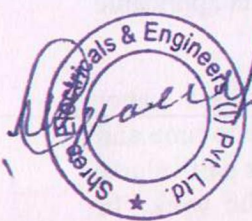
All disputes and differences of any kind whatever arising out of or in connection with the contract or the carrying out of the work (whether during progress of the works or after their completion and whether before or after the determination, abandonment or breach of the contract) shall be referred to and settled by Project Engineer. But if the contractor be dissatisfied with the decision of the Chief Executive Officer ASCL or as to withholding by the Project Engineer of any certificate of the Project Engineer or as to withholding by the Project Engineer of any certificate to which the contractor may within

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60 days after receiving notice of such decision give a return notice to the other party requiring that / may claim to entitled them and in any such case the contractor such matters in disputes be referred to in an appeal before a Committee as mentioned below. Such return notice shall specify the manner which are in disputes and such disputes or difference of which such notice has been given and no other shall be and is hereby referred to Committee consisting of the Chief Executive Officer ASCL, the decision taken by the committee will be final and binding on both the parties Such reference except as to the withholding of any certificate to which the contractor to be entitled shall not be opened or entered upon until after the completion or alleged completion of the works or until after the practical cessation of the works arising from any cause unless with the written consent of the Project Engineer. Provided always that the Corporation shall not withhold the payment of an interim certificate nor the contractor in any way delay the carrying out of the works by reason of any such matters, question or dispute being referred to the Committee but shall, proceed with the work with all the diligence and shall, until the decision of the Committee abide by the decision of the Project Engineer and no award of the Committee shall relieve the contractor of his obligations to adhere strictly to Project Engineer's instructions with regard to the actual carrying out of the works. The Owner and the contractor hereby also agree that the said reference to the Committee under this clause shall be a condition precedent to any right of action under the Contract.

Contractor shall take out necessary Insurance Policy /policies for all workmen, labor employed on site so as to provide adequate Insurance cover for execution of the awarded contract work from National Insurance Co Ltd. Insurance Policy/policies taken out from any other company will not be accepted. He shall submit the receipt of premium to ASCL before work commencement supply of machinery shall not form a ground for any claim or extension of time limit for this work.



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Electrical Work Specification

INDIAN STANDARD SPECIFICATIONS


ISS 1.0 All work covered by these specifications has to be carried out as per specifications contained in the relevant Indian Standard Specifications and Code of Practice (both latest editions). However, wherever specifications drawn up for this Contract specifically differ from those of the relevant ISS, then the Contract specifications take precedence over those of ISS.

Some of the relevant ISS are reproduced below:

- | | | |
|-------|---|---|
| 2026 | - | Power transformers. |
| 13947 | - | Circuit breakers. |
| 3043 | - | Earthing. |
| 9815 | - | Automatic Voltage Regulators |
| 2705 | - | Current transformers. |
| 3156 | - | Voltage transformers. |
| 1818 | - | Outdoor Air breakers isolators. |
| 398 | - | ACSR conductors. |
| 3427 | - | Metal enclosed switchgear above 1000V but not exceeding 11KV. |
| 4770 | - | Rubber gloves for electric purposes. |
| 335 | - | Insulating oil for transformer. |
| 731 | - | Porcelain insulators for O/H power lines. |
| 2486 | - | Insulator fittings for O/H power lines. |
| 2544 | - | Post type insulators |
| 3231 | - | Electric relays for power systems. |
| 5216 | - | Guides for safety procedures & practice in electrical works. |
| 9224 | - | HRC fuses. |


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8623 (part I) - Factory assembled switchboards. Factory built assemblies of switchgear and control gear for voltages upto and including 1000 V AC and 1200 V D C.

8623 (part II) - Bus bar trunking system

8828 - Miniature circuit breakers.

2834 - Power capacitors.

2713 - Steel tubular poles.

732 - Code of practice for electrical wiring installations.

2309 - Code of practice for lightning protection.

SP30 - National electrical code.

1554 - PVC insulated (Heavy Duty) electric cables for working voltages upto and including 1100 volts.

7098 - Cables, XLPE insulated Cross linked polyethylene insulated PVC sheathed cables. For working voltages from 3.3 KV upto and including 33 KV

694 - PVC insulated cables for working voltages upto and including 1100V.

692 - PILC insulated cables.

10001 - General purpose diesel engine upto 20KW

10002 - General purpose diesel engine above 20KW.

1460 - Diesel Fuel.

4722 - Alternator.

374 - Ceiling fans and regulators

375 - Marking & arrangement for switchgear busbars, main &auxilliary wiring.

1255 - code of practice for installation and maintenance of power cables upto and including 33 KV rating

1258 - Bayonet lamp holders

1293 -Three pin plugs and sockets outlets rated voltage upto and including 250 volts and rated current upto and including 160 amps.

8130 - Conductors for insulated electric cables and flexible cords

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9537	-	Rigid Steel Conduits for electrical wiring
10810	-	Methods of test for cables
11171	-	Specifications for dry type transformers
12640	-	earth leakage circuit breakers
1651 & 1652	-	Stationary cell and batteries, lead acid type
1885	-	Glossary of items for electrical cables and conductors
1913 tubular	-	General and safety requirements for fluorescent lamps luminaries
2026	-	Power transformer
2071	-	methods of high voltage testing
2551	-	Danger notice plate
3480	-	Flexible steel conduits for electrical wiring
4146	-	Application guide for voltage transformers
4615	-	Switch socket outlets
5133	-	Boxes for the enclosure of electrical accessories
5424	-	rubber mats for electrical purposes
5578 & 11353	-	Marking and arrangement of bus bars

WIRING

General:

All material shall be confirming to relevant standard as per BIS and shall carry ISI mark. Work shall be carried out as per the Method of Construction specified by BIS. If there is no reference for particular Method of Construction in IS, such work shall be carried out as per the approved Material and Work not qualifying to any provision mentioned above shall be to the satisfaction of the Engineer in Charge.

Material shall be tested in approved Testing Laboratory and shall qualify the relevant tests as and when directed by Engineer In-charge.

Recommended Standards:

The following list is showing Indian Standards, which are acceptable as good practice, and accepted standards.

IS 732: 1989

Code of Practice for Electrical Wiring Installations

IS 4648: 1968

Guide for Electrical Layout in residential buildings

IS 9537 (Part 1): 1980

Conduits for Electrical Installations: General requirements



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IS 9537 (Part 2): 1981	Rigid Steel Conduits
IS 9537 (Part 3): 1983	Rigid Plain Conduits of insulating material
IS 3419: 1989	Specifications for fittings for rigid non metallic conduits
IS 694:	PVC insulated cables for working voltages up to and including 1100V
IS 1554 (Part 1): 1988	PVC insulated (heavy-duty) electric cables for working Voltages up to and including 1100V
IS 3961 (Part 5): 1968	Recommended current ratings for cables: PVC insulated Light duty cables.
IS 4288: 1988	PVC insulated (heavy-duty) electric cables with solid Aluminium conductors for voltages up to and including 1100V
IS 14772: 2000	Specifications for Accessories for household and similar Fixed Electrical Installations
IS 3043: 1987	Code of practice for Earthing
SP 30: 1984	National Electrical Code
SP 7 (Group 4): 2005	National Building Code
IS 14927 (Part 1): 2001	Cable Trunking and Ducting systems for electrical Installations.

Point wiring (Surface type)

Scope:

Point wiring (Surface type):

Providing all required approved specified material including hardware and erecting wiring on surface of wall, ceiling from switch board to outlet for light / fan / bell / independent plug point, in rigid steel / PVC conduit or PVC trunking as specified; fixing one board with a 1 way switch for one way point or two boards with a 2 way switch on each board, in case of 2 way point; for controlling power supply and one board / block with accessory for outlet of light / fan / plug and terminating wires within as per approved Method of Construction; removing all debris and testing the installation for safety and beneficial use.

Material:

Point wiring (Surface)

PVC conduit:

PVC pipe of minimum 20mm dia and above depending No. of wires to be drawn (refer Table No 1/2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, inspection or non inspection type Elbows, Tees, Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

PVC Trunking:

PVC Trunking (casing capping) ISI mark, 1.2 mm thick, minimum 20mm width and above depending on No. of wires to be drawn (Refer Table No 1/2 for the size of trunking and number of wires to be drawn); with double locking arrangement, 1.8 mm thick push-fit joints / accessories for PVC trunking such as couplers, elbows, internal / external angles, junction boxes of required ways of the same make.

Rigid Steel conduit:

Rigid steel screwed conduit minimum 20mm dia and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ISI mark, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as 5mm thick 20mm width

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spacers and G.I. saddles for individual pipe or GI strip for bunch of pipes, sockets, inspection type or normal; open bends, junction boxes of required ways all of the same make.

Wires: Phase and Neutral

PVC insulated wires of specified size, 1.1 kV, & minimum FR grade insulation, electrolytic tough pitch (ETP) copper conductor, ISI marked, of required colour coding as per Table No 1/5

Earth Wire:

PVC insulated minimum FR grade copper wires of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked. 2.5 Sqmm or bare copper wire of 14 gauge.

Accessories:

Switch: 1 or 2 way Piano type 6/10 A, 1 or 2 way Modular type switch 6/10A.

Outlet: 6A angle / batten lamp holder or 3 plate ceiling-rose or Bakelite / porcelain three way connector or if plug point, 6A, 3-pin plug socket.

Boards:

Switchboards shall be double walled (back and front) of suitable size, to accommodate independent slot for each switch, socket, fan regulator. Boards shall be made up of 4mm thick marine grade plywood for back and front fixed on wooden frame with 0.8mm thick laminate pasted on exposed portion of front ply, totally varnished and with either brass hinged door or screwed top.

Or

As above with 3mm thick Bakelite/Hylam top instead of laminated front ply.

Or

Board made from Filled polypropylene.

Round/Square double wooden block or PVC board for mounting light / fan outlet accessory.

Hardware:

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC / fill type plugs, wooden gutties, PVC / rubber bushings etc.

Method of Construction:


Point wiring (Surface):

Erection of conduits:

General:

Erection shall be done as per the final approved layout, in perfect level and plumb. Conduits shall be duly screwed and firmly fixed on spacers with saddles. Fixing of spacers shall be equidistant and at ends, bends, plugs, elbows, junction boxes, couplings, boards. CSK screws of minimum 35x8 mm and suitable plugs shall be used for fixing spacers and 12x5 mm round headed for fixing saddles on spacers. In case of stonewalls wooden gutties shall be grouted in wall for fixing of spacers and saddles. Distance between 2 spacers shall not be more than 600mm. Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution. Also for wiring for other utilities like data, telephone, TV cabling distance between pipes shall not be less than 300 mm. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of surface conduit with colour coding (For Visual identification) as per Table No. 1/4. Flexible conduits shall be used at expansion joints. Bushing shall be provided at open ends.




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Erection of conduits:

PVC pipes for surface type wiring:

In addition to General conditions above, all joints shall be made rigid with / adhesive. Wherever offsets are necessary, same shall be done with bending spring. Size of conduit shall be correct depending on number of wires to be drawn as per Table No. 1/2.

Or

Specially for Rigid Steel Conduit of surface type wiring:

In addition to general conditions above, size of conduit shall be correct depending on number of wires to be drawn (as per Table No. 1/1 for steel conduits). All exposed threaded portion of Rigid steel Conduits shall be painted with anti corrosive paint. Sharp edges and burr at cut ends shall be made smooth. Inspection type conduits accessories shall be used as per requirement in accessible position to facilitate drawing or withdrawing of wires. All conduits piping work shall be properly earthed with 2.5 sq. mm G.I. Earth wire fixed to conduit and made continuous with Earth clips at every 1m and at ends and joints viz. bends, junction boxes.

Or

Erection of PVC Trunking for surface type wiring:

Erection shall be done as per the final approved layout. The Trunking shall be in perfect level and plumb. Screws of minimum 35x8 mm and suitable plugs shall be used for fixing. In case of unlevelled surface number and size of screws shall be changed to higher size as per requirement and in case of stonewalls wooden gutties shall be grouted in wall for fixing of screws of Trunking. Distance between 2 screws shall not be more than 600 mm. Size of Trunking shall be correct depending on number of wires to be drawn as per Table No 1/3 but not less than 20mm. Separate Trunking shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring of other utilities like data, telephone, TV cabling and distance of 300 mm shall be maintained between the Trunking. Double locking shall be checked while fixing capping. Adequate use of accessories shall be made at joints and required locations.

Drawing of wires: General

Wires shall be drawn with adequate care. Correct colour coding as per Table No 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped within circuit. For lighting load distribution wires of two different phases shall not be drawn in single pipe. Wires shall be terminated in the terminals of accessories only. Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq. mm or as per specified shall be erected wherever necessary. In case of 2-way point wiring additional wires of phase conductor shall be provided between the 2-way switches.

Drawing of wires: through PVC conduits for surface type wiring

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2

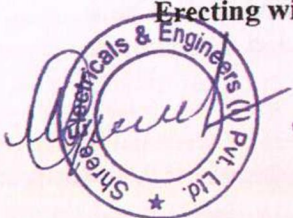
Or

Drawing of wires: through Rigid Steel conduits for surface type wiring

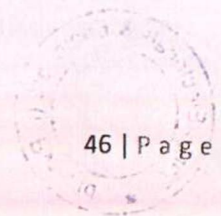
Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs / sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/1.

Or

Erecting wires in Trunking:



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Wires shall be erected within Trunking with adequate care. Number of wires shall not exceed with respect to size of Trunking as per Table No. 1/3. After erection of wires double locking shall be checked while fixing capping.

Fixing Switchboards and accessories:

Control switchboards shall generally be erected at 1.35m height or as specified and fixed with minimum 2 Nos. (and more as per size of board) of screws of length not less than 50 mm, termination of wires shall be done with lugs on switch and other accessories only by carefully inserting all strands in lugs, terminals and proper tightening. Switches shall be provided on phase wire only. Bare wire shall not be used for looping incoming supply to switches and for earthing inside switchboards. For plug socket phase wire shall be connected in right side terminal when seen from front. Proper termination of earth wire in Earth terminal shall be ensured.

Testing:

Insulation resistance test:

All wiring shall be tested with 500V Meggar between phases, phase-neutral and to Earth. IR value shall not be less than 1M-ohm.

Earth continuity:

Earth continuity shall be ensured at all earth terminals of plug outlets and at earth terminals of metal enclosures.

Polarity test:

Polarity test shall be carried out for ensuring the correct polarity in switch and plug.

Mode of Measurement:

Measurement shall be carried out on the basis per number of points, **for the point length up to 6 metre between switch and outlet.** For the length exceeding 6 metre 10% of overall rate shall be added for every 1 m.

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Point wiring (Concealed type)

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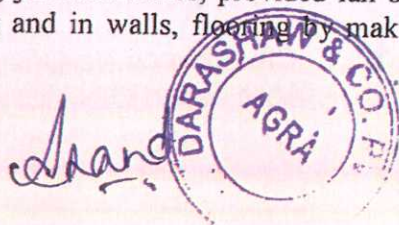
Specification No

(WG - PW/CW)

Scope:

Point wiring (Concealed type):

Providing all required approved specified material including hardware and erecting rigid steel, / PVC conduits, junction boxes, provided fan boxes, along with required accessories in RCC slabs before casting and in walls, flooring by making chases, and refilling the same after erection of



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conduits, fixing concealed type boxes for switch boards in walls, drawing wires through conduits, from switch board to outlet for light / fan / bell / independent plug point fixing modular type switch for controlling power supply and an accessory for outlet of light / fan / bell / plug at other end, with mounting plate, and terminating wires within at both ends, as per approved Method of Construction, closing all junction boxes with plates; removing all debris and testing the installation for safety and beneficial use.

Material:

Point wiring (Concealed):

PVC conduit:

PVC pipe of minimum 20mm dia and above depending No. of wires to be drawn (refer Table No 1/2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, deep / normal Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

Rigid Steel conduit:

Rigid steel screwed conduit minimum 20mm dia and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ISI mark, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as sockets, bends, deep / normal junction boxes of required ways all of the same make.

Sheet metal Junction boxes / Draw – in boxes:

Junction box shall be 5 sided with removable top plate, fabricated from 16 gauge CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia for entry of conduit pipes and arrangement to fix surface cover plate on it. Cover plate shall be made up of fire resistant PVC material / 3mm thick laminate / Bakelite / Hylam / transparent acrylic sheet painted from inside to match colour of wall duly tapered edges.

Wires: phase and neutral wires

PVC insulated wires of specified size, 1.1 kV, & minimum FR grade insulation, electrolytic tough pitch (ETP) copper conductor, ISI marked, of required colour coding as per Table No. 1/5

Earth Continuity Wire:

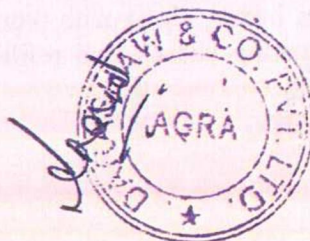
PVC insulated minimum FR grade copper wires of electrolytic grade, having insulation of 1.1 kV grade, of green colour, ISI marked, 2.5 Sqmm or bare copper wire of 14g

Lugs: Pin type Copper lugs.

Switch: 1 or 2 way Modular type switch 6/10A.

Outlet:

Modular type 6A angle / batten lamp holder or 3 plate ceiling – rose or Bakelite / porcelain 3 way connector or if plug point, 6A, 3-pin plug shuttered socket.



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Switchboards shall comprise of; concealed type box of required modules made of sheet metal or Polypropylene material, mounting plate and cover plate. The required modules shall be worked out on the basis of points, plug socket/sockets, step type fan regulator, etc are to be fixed. For every blank module, 1 way blank plate shall be fixed. All the above accessories shall be of same make, as that of switch.

Hardware:

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC / fill type plugs / wooden gutties, 'U' nails, plumbing nails, steel binding wire, fish wire 20 gauge, rubber / PVC bushes etc.

Other material for Surface finishing: Sand, Cement, water etc.

Method of Construction:

Point wiring (Concealed):

Concealing of conduits:

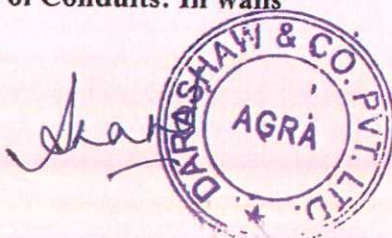
General:

Work shall be done in co-ordination with civil work and to suit final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No. 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All the bends shall be done with Bending Spring.

Concealing of conduits: in RCC work

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed on steel of RCC work by binding wire. Fixing of conduits shall be such that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers / sockets at ends and be flush with bottom of beam, and at located at the center of the beam. As per as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through in the conduits for drawing of wires later on.

Concealing of Conduits: In walls



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Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the surface shall be done. Conduits of adequate size shall be erected with use of appropriate accessories and 'U' nails.

Drawing of wires:

Use of Steel fish wire shall be made for drawing of wires. Wires shall be drawn with adequate care. Correct colour coding shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped within circuit only. For lighting load distribution, wires of two different phases shall not be drawn in single pipe. Wires shall be terminated in the terminals of accessories only. Adequate extra length shall be left at termination points. In case of 2-way point wiring additional wires of phase conductor shall be provided between the 2-way switches.

Fixing Switchboards and accessories:

Control switchboards shall generally be erected at 1.35m height or as specified and fixed with minimum 2 Nos. of screws of length not less than 50 x 8mm, Boards shall be in line and plum and shall be in level with wall surface so as to fix mounting plate flush with wall, Termination of wires shall be done in switch and other accessories only by carefully inserting all strands in terminals and proper tightening. Switches shall be provided on phase wire only. Bare wire shall not be used for looping incoming supply to switches. Phase wire shall be routed through switch only. For plug socket phase wire shall be connected in right side terminal when seen from front. Proper termination of earth wire in Earth terminal shall be ensured. All blank modules shall be plugged with blanking plates.

Testing:

Insulation resistance test:

All wiring shall be tested with 500V Megglr between phases, phase-neutral and to Earth. IR value shall not be less than 1M-ohm.

Earth continuity:

Earth continuity shall be ensured at all earth terminals of plug outlets and at earth terminals of metal enclosures.

Polarity test:

Polarity test shall be carried out for ensuring the correct polarity in the plug.

Mode of Measurement:

Measurement shall be carried out on the basis per number of points, **for the point length up to 6 metre between switch and outlet.** For the length exceeding 6 metre 10% of overall rate shall be added for every 1 metre.

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Measurement for light / fan/ exhaust fan / 5A plugs / call bell point shall be carried out on the basis per number of points, as under:-

Short Point : up to a circuit length of 3 metre.

Medium Point: for circuit length greater than 3 metre and up to 6 metre.

Long Point : circuit length greater than 6 metre and up to 10 metres.

In case of power point measurement for long point is same as above and EL-I = > 10 metre but up to 15 mtrs.

EL - II = > 15m but up to 20m.

EL - III = > 20m but up to 25 mtrs.

Above 25 mtrs length measurement, the extra length will be taken in respective circuit measurement.

Table No. 1/1

Maximum number of Single core 1.1 kV Cables that can be drawn in Rigid Steel Conduits

Size of cable mm		Size of conduit mm													
Nominal Cross Sectional Area	No & dia of wires	16		20		25		32		40		50		53	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B
1.0	1/1.12Cu	5	4	7	5	13	10	20	14						
1.5	1/1.4	4	4	7	5	12	10	20	14						
2.5	1/1.8	3	3	0	5	10	8	18	12						
	3/1.06 Cu														
4.0	1/2.24	3	2	4	3	7	8	12	10						
	7/0.85 Cu														
5	1/2.8	2	2	3	2	6	5	10	8						
	7/1.06														

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	Cu													
10	11/3.55 Al 7/1.40Cu			2		5	4	8	7					
				2		4	3	6	5					
16	7/1.70					2		4	3	7	6			
25	7/2.24							3	2	5	4	8	6	9
35	7/2.50							2		4	3	7	5	8
50	7/3.0Al 19/1.80									2		5	4	6
													5	

Note 1: Cu – applicable to only copper cable; Al – applicable to only Aluminum

Note 2: the table shows maximum capacity of conduits for the simultaneous drawing of cables. The columns headed 'S' apply to straight runs of conduits which have distance not exceeding 4.25m between draw in boxes and which do not deflect from straight by an angle more than 15 degrees. The columns headed 'B' apply to bent runs of conduit, which deflect from the straight by an angle of more than 15 degrees.

Note 3: In case of inspection type draw in box has been provided and if the cable is first drawn through one straight conduit, then through the draw in box and then through the second straight conduit. Such system may be considered as that of straight conduit even if the conduit deflects through the straight by more than 15 degrees

Maximum number of Single core 1.1 kV Cables that can be Drawn in Rigid Non-Metallic Conduits

Size of cable mm ²		Size of conduit mm					
Nominal Cross Sectional Area	No & dia of wires	16	20	25	32	40	50
1.0	1/1.12Cu	5	7	13	20		
1.5	1/1.4	4	6	10	14		



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2.5	1/1.8 3/1.06 Cu	3	5	10	14		
4.0	1/2.24 7/0.85 Cu	2	3	6	10	14	
6	1/2.8 7/1.06 Cu		2	5	9	11	
10	11/3.55 Al 7/1.40Cu			4	7	9	
16	7/1.70			2	4	5	12
25	7/2.24				2	2	6
35	7/2.50					2	6
50	7/3.0 Al 19/1.80					2	5
						2	3

Note 1: Cu – applicable to only copper cable; Al – applicable to only Aluminium

Table No. 1/3

Maximum number of Single core 1.1 kV in Cable Trunking (Casing andCapping)

Size of cable mm2		Size of Trunking mm				
Nominal Cross Sectional Area	12/16 X12 mm	20X12 mm	25X12m m	32X12m m	40X20mm	50X20mm
1.0						
1.5	3	5	6	8	12	18
2.5	2	4	5	6	9	15
4.0	2	3	4	5	8	12

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6		2	3	4	6	9
10		1	2	3	5	8
16			1	2	4	6
25				1	3	5
35					2	4
50					1	3

Note 1: Cu – applicable to only copper cable; Al – applicable to only Aluminium

Table No: 1/4

Table No: 1/5

Colour Coding For Conduits in Wall

Entry Colour Codes for Wires

Conduit For	Colour
Light/ Power circuit	Black
Security Wiring	Blue
Fire Alarm wiring	Red
Low Voltage Circuits	Brown
UPS circuits	Green

Type	Colour
Phase	Red, Yellow, Blue
Neutral	Black
Earth	Green

Power Points Wiring (Concealed type)

Power Points Wiring in PVC Conduits in RCC work

Scope:

Concealed Mains in PVC Conduits in RCC work:

Providing specified PVC conduit, wires and laying / erecting Conduits in RCC work, such as slab, beam, column before casting as per approved Method of Construction along with of all required material including hardware, binding wire, fish wire; accessories such as deep PVC junction boxes, MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and



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making all piping rigid, removing debris from site and supervising the work during casting to confirm rigidity, continuity and avoid damages and as and when directed drawing of specified wires through these conduits with fish wire, tagging with coded ferrules and duly connecting with lugs, complete testing the installation for safety and beneficial use.

Material:

PVC Conduit:

PVC pipe of minimum 20mm dia and above, depending on number of wires to be drawn (refer Table No 1/2, ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, deep Junction boxes of required ways and resin / adhesive to make all joints rigid.

Junction boxes / Draw-in boxes:

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16 SWG CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. or entry of conduit pipes and arrangement to fix cover plates on it.

Hardware:

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, GI fish wire, etc.

Wires: Mains I Sub-mains I Circuit mains (comprising phase and neutral wires):

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

Earth Continuity Wire: PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 4 Sqmm as per Table No 1/5

Lugs: Copper lugs of required size & type

Other material: Rubber grommet, bush, harnessing material, flexible conduit etc.

Method of Construction:

Concealing of PVC conduits:

General:

Work shall be done in co-ordination with civil work and to suit final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph



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distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit, accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All PVC conduit bending shall be done with Bending Spring. All joints shall be made rigid with resin. 12

Concealing of PVC conduits:

In RCC work:

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed on steel of RCC work by binding wire. Fixing of conduits shall be such that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers/ sockets at ends and be flush with bottom of beam, and at located at the center of the beam. As far as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through in the conduits for, drawing of wires later on.

Drawing of wires:

General:

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with appropriate type and size of lugs.

Drawing of wires:

Through PVC conduits:

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as per specified shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2.



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Concealed Power Points Wiring in PVC Conduits in walls /flooring:

Scope:

Concealed Mains in PVC Conduits in walls / flooring:

Providing specified PVC conduit, Wires and laying / erecting the conduits in wall, flooring by making chases / grooves / entries as per approved Method of Construction along with of all required material including hardware such as 'IF' nails, binding wire, fish wire; accessories such as PVC / MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, refinishing the surface with cement mortar, removing debris from site and as and when directed drawing of specified wires through these conduits with fish help of wire, tagging by coded ferrules and duly connecting / terminating with lugs, complete testing the installation for safety and beneficial use.

Material:

PVC Conduit:

PVC pipe minimum 20mm dia and above depending No. of wires to be drawn (refer Table No1/2, ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, Junction boxes of required ways and resin / adhesive to make all joints rigid.

Junction boxes / Draw-in boxes:

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16g CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plate on it.

Hardware:


'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, steel fish wire, etc.

Other material for Surface finishing: Cement, sand, putty and water.

Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):

PVC insulated Wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5




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Earth Continuity Wire: PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 4 Sqmm as per Table No 1/5

Lugs: Copper lugs of appropriate size & type

Other material for wire drawing: Rubber grommet, bush, harnessing material, flexible conduit etc.

Method of Construction:

Concealing of PVC conduits:

General:

Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All bending of conduits shall be done with Bending Spring. All joints shall be made rigid with resin.


Concealing of PVC Conduits In walls / flooring:

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the wall surface shall be done. Work in flooring shall not disturb RCC work, Conduits of adequate size shall be erected with use of appropriate accessories, and 'U' nails. All joints shall be made rigid with resin. Draw-in / inspection boxes shall be fixed with check-nut, flush with surrounding surface and earthed.

Drawing of wires:

General:

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe.


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Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with correct type of and correct size of lugs.

Drawing of wires

Through PVC conduits:

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as per specified shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2, At the termination end flexible PVC conduit shall be used with gland as per necessity.

Mains (Concealed type)

Mains in PVC Conduits in RCC work

Scope:

Concealed Mains in PVC Conduits in RCC work:

Providing specified PVC conduit, wires and laying / erecting Conduits in RCC work, such as slab, beam, column before casting as per approved Method of Construction along with of all required material including hardware, binding wire, fish wire; accessories such as deep PVC junction boxes, PVC / MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, removing debris from site and supervising the work during casting to confirm rigidity, continuity and avoid damages and as and when directed drawing of specified wires through these conduits with fish wire, tagging with coded ferrules and duly connecting with lugs, complete testing the installation for safety and beneficial use.

Material:

PVC Conduit:

PVC pipe of minimum 20mm dia and above, depending on number of wires to be drawn (refer Table No 1/2, ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, deep Junction boxes of required ways and resin / adhesive to make all joints rigid.

Junction boxes / Draw-in boxes:

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16 SWG CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. or entry of conduit pipes and arrangement to fix cover plates on it.

Hardware:



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'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, GI fish wire, etc.

Wires: Mains I Sub-mains I Circuit mains (comprising phase and neutral wires):

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

Earth Continuity Wire: PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 1.5 Sqmm as per Table No 1/5

Lugs: Copper lugs of required size & type

Other material: Rubber grommet, bush, harnessing material, flexible conduit etc.

Method of Construction:

Concealing of PVC conduits:

General:

Work shall be done in co-ordination with civil work and to suit final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit, accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All PVC conduit bending shall be done with Bending Spring. All joints shall be made rigid with resin. 12

Concealing of PVC conduits:

In RCC work:

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed on steel of RCC work by binding wire. Fixing of conduits shall be such that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel reinforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers/ sockets at ends and be flush with bottom of beam, and at located at



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the center of the beam. As far as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through in the conduits for, drawing of wires later on.

Drawing of wires:

General:

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with appropriate type and size of lugs.

Drawing of wires:

Through PVC conduits:

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as per specified shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2.

Concealed Mains in PVC Conduits in walls /flooring:

Scope:

Concealed Mains in PVC Conduits in walls / flooring:

Providing specified PVC conduit, Wires and laying / erecting the conduits in wall, flooring by making chases / grooves / entries as per approved Method of Construction along with of all required material including hardware such as 'IF' nails, binding wire, fish wire; accessories such as PVC / MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, refinishing the surface with cement mortar, removing debris from site and as and when directed drawing of specified wires through these conduits with fish help of wire, tagging by coded ferrules and duly connecting / terminating with lugs, complete testing the installation for safety and beneficial use.

Material:

PVC Conduit:

PVC pipe minimum 20mm dia and above depending No. of wires to be drawn (refer Table No1/2, ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, Junction boxes of required ways and resin / adhesive to make all joints rigid.



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Junction boxes / Draw-in boxes:

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16g CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plate on it.

Hardware:

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, steel fish wire, etc.

Other material for Surface finishing: Cement, sand, putty and water.

Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):

PVC insulated Wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

Earth Continuity Wire:

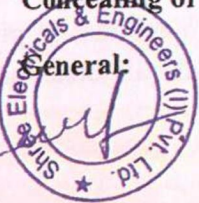
PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 2.5 Sqmm as per Table No 1/5

Lugs: Copper lugs of appropriate size & type

Other material for wire drawing: Rubber grommet, bush, harnessing material, flexible conduit etc.

Method of Construction:

Concealing of PVC conduits:



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Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All bending of conduits shall be done with Bending Spring. All joints shall be made rigid with resin.

Concealing of PVC Conduits In walls / flooring:

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the wall surface shall be done. Work in flooring shall not disturb RCC work, Conduits of adequate size shall be erected with use of appropriate accessories, and 'U' nails. All joints shall be made rigid with resin. Draw-in / inspection boxes shall be fixed with check-nut, flush with surrounding surface and earthed.

Drawing of wires:

General:

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with correct type of and correct size of lugs.

Drawing of wires

Through PVC conduits:

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as per specified shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2, At the termination end flexible PVC conduit shall be used with gland as per necessity.

Group Point wiring (Surface type)

Scope:



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Point wiring (Surface type):

Providing all required approved specified material including hardware and erecting wiring on surface of wall, ceiling from switch board to outlet for light / fan / bell / independent plug point, in rigid steel / PVC conduit or PVC trunking as specified; fixing in loop with primary points; for controlling power supply and one board / block with accessory for outlet of light / fan / plug and terminating wires within as per approved Method of Construction; removing all debris and testing the installation for safety and beneficial use.

Material:

Group Point wiring (Surface)

PVC conduit:

PVC pipe of minimum 20mm dia and above depending No. of wires to be drawn (refer Table No 1/2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, inspection or non inspection type Elbows, Tees, Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

PVC Trunking:

PVC Trunking (casing capping) ISI mark, 1.2 mm thick, minimum 20mm width and above depending on No. of wires to be drawn (Refer Table No 1/2 for the size of trunking and number of wires to be drawn); with double locking arrangement, 1.8 mm thick push-fit joints / accessories for PVC trunking such as couplers, elbows, internal / external angles, junction boxes of required ways of the same make.

Rigid Steel conduit:

Rigid steel screwed conduit minimum 20mm dia and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ISI mark, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as 5mm thick 20mm width spacers and G.I. saddles for individual pipe or GI strip for bunch of pipes, sockets, inspection type or normal; open bends, junction boxes of required ways all of the same make.

Wires: Phase and Neutral

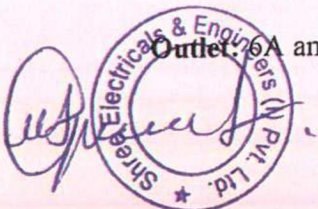
PVC insulated wires of specified size, 1.1 kV, & minimum FR grade insulation, electrolytic tough pitch (ETP) copper conductor, ISI marked, of required colour coding as per Table No 1/5


Earth Wire:

PVC insulated minimum FR grade copper wires of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked. 2.5 Sqmm or bare copper wire of 14 gauge.

Accessories:

Outlet, 6A angle / batten lamp holder or 3-plate ceiling-rose or Bakelite / porcelain




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three way connector or if plug point, 6A, 3-pin plug socket.

Hardware:

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC / fill type plugs, wooden gutties, PVC / rubber bushings etc.

Method of Construction:

Group Point wiring (Surface):

Erection of conduits:

General:

Erection shall be done as per the final approved layout, in perfect level and plumb. Conduits shall be duly screwed and firmly fixed on spacers with saddles. Fixing of spacers shall be equidistant and at ends, bends, plugs, elbows, junction boxes, couplings, boards. CSK screws of minimum 35x8 mm and suitable plugs shall be used for fixing spacers and 12x5 mm round headed for fixing saddles on spacers. In case of stonewalls wooden gutties shall be grouted in wall for fixing of spacers and saddles. Distance between 2 spacers shall not be more than 600mm. Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution. Also for wiring for other utilities like data, telephone, TV cabling distance between pipes shall not be less than 300 mm. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of surface conduit with colour coding (For Visual identification) as per Table No. 1/4. Flexible conduits shall be used at expansion joints. Bushing shall be provided at open ends.

Erection of conduits:

PVC pipes for surface type wiring:

In addition to General conditions above, all joints shall be made rigid with / adhesive. Wherever offsets are necessary, same shall be done with bending spring. Size of conduit shall be correct depending on number of wires to be drawn as per Table No. 1/2.

Or

Specialty for Rigid Steel Conduit of surface type wiring:

In addition to general conditions above, size of conduit shall be correct depending on number of wires to be drawn (as per Table No. 1/1 for steel conduits). All exposed threaded portion of Rigid steel Conduits shall be painted with anti corrosive paint. Sharp edges and burr at cut ends shall be made smooth. Inspection type conduits accessories shall be used as per requirement in accessible position to facilitate drawing or withdrawing of wires. All conduits piping work shall be properly earthed with 2.5 sq. mm G.I. Earth wire fixed to conduit and made continuous with Earth clips at every 1m and at ends and joints viz. bends, junction boxes.


Or

Erection of PVC Trunking for surface type wiring:

Erection shall be done as per the final approved layout. The Trunking shall be in perfect level and plumb. Screws of minimum 35x8 mm and suitable plugs shall be used for fixing. In case of unlevelled surface number and size of screws shall be changed to higher size as per requirement and in case of stonewalls wooden gutties shall be grouted in wall for fixing of screws of Trunking. Distance between 2 screws shall not be more than 600 mm. Size of Trunking shall be correct depending on number of wires to be drawn as per Table No 1/3 but not less than 20mm. Separate Trunking shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring of other utilities like data, telephone, TV cabling and distance of 300 mm shall be maintained between the Trunking. Double locking shall be checked while fixing capping. Adequate use of accessories shall be made at joints and required locations.

Drawing of wires: General




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Wires shall be drawn with adequate care. Correct colour coding as per Table No 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped within circuit. For lighting load distribution wires of two different phases shall not be drawn in single pipe. Wires shall be terminated in the terminals of accessories only. Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq. mm or as per specified shall be erected wherever necessary. In case of 2-way point wiring additional wires of phase conductor shall be provided between the 2-way switches.

Drawing of wires: through PVC conduits for surface type wiring

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2

Or

Drawing of wires: through Rigid Steel conduits for surface type wiring

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs / sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/1.

Or

Erecting wires in Trunking:

Wires shall be erected within Trunking with adequate care. Number of wires shall not exceed with respect to size of Trunking as per Table No. 1/3. After erection of wires double locking shall be checked while fixing capping.

Fixing Switchboards and accessories:

Control switchboards shall generally be erected at 1.35m height or as specified and fixed with minimum 2 Nos. (and more as per size of board) of screws of length not less than 50 mm, termination of wires shall be done with lugs on switch and other accessories only by carefully inserting all strands in lugs, terminals and proper tightening. Switches shall be provided on phase wire only. Bare wire shall not be used for looping incoming supply to switches and for earthing inside switchboards. For plug socket phase wire shall be connected in right side terminal when seen from front. Proper termination of earth wire in Earth terminal shall be ensured.

Testing:

Insulation resistance test:

All wiring shall be tested with 500V Meggar between phases, phase-neutral and to Earth. IR value shall not be less than 1M-ohm.

Earth continuity:

Earth continuity shall be ensured at all earth terminals of plug outlets and at earth terminals of metal enclosures.

Polarity test:

Polarity test shall be carried out for ensuring the correct polarity in switch and plug.

Mode of Measurement:


Measurement shall be carried out on the basis per number of points, for the point length up to 6 metre between switch and outlet. For the length exceeding 6 metre 10% of overall rate shall be added for every 1 m.

Group Point wiring (Concealed type)

Scope:

Point wiring (Concealed type):

Providing all required approved specified material including hardware and erecting rigid steel, / PVC conduits, junction boxes, provided fan boxes, along with required accessories in RCC slabs


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before casting and in walls, flooring by making chases, and refilling the same after erection of conduits, fixing concealed type boxes for switch boards in walls, drawing wires through conduits, from primary point to outlet for light / fan / bell / independent plug point fixing modular type switch for controlling power supply and an accessory for outlet of light / fan / bell / plug at other end, with mounting plate, and terminating wires within at both ends, as per approved Method of Construction, closing all junction boxes with plates; removing all debris and testing the installation for safety and beneficial use.

Material:

Group Point wiring (Concealed):

PVC conduit:

PVC pipe of minimum 20mm dia and above depending No. of wires to be drawn (refer Table No 1/2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, deep / normal Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

Rigid Steel conduit:

Rigid steel screwed conduit minimum 20mm dia and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ISI mark, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as sockets, bends, deep / normal junction boxes of required ways all of the same make.

Sheet metal Junction boxes / Draw – in boxes:

Junction box shall be 5 sided with removable top plate, fabricated from 16 gauge CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia for entry of conduit pipes and arrangement to fix surface cover plate on it. Cover plate shall be made up of fire resistant PVC material / 3mm thick laminate / Bakelite / Hylam / transparent acrylic sheet painted from inside to match colour of wall duly tapered edges.

Wires: phase and neutral wires

PVC insulated wires of specified size, 1.1 kV, & minimum FR grade insulation, electrolytic tough pitch (ETP) copper conductor, ISI marked, of required colour coding as per Table No. 1/5.

Earth Continuity Wire:

PVC insulated minimum FR grade copper wires of electrolytic grade, having insulation of 1.1 kV grade, of green colour, ISI marked, 2.5 Sqmm or bare copper wire of 14g

Lugs: Pin type Copper lugs.

Outlet:

Modular type 6A angle / batten lamp holder or 3 plate ceiling – rose or Bakelite / porcelain 3 way connector or if plug point, 6A, 3-pin plug shuttered socket.

Hardware:

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC / fill type plugs / wooden gutties, 'U' nails, plumbing nails, steel binding wire, fish wire 20 gauge, rubber / PVC bushes etc.

Other material for Surface finishing: Sand, Cement, water etc.

Method of Construction:

Group Point wiring (Concealed):

Concealing of conduits:

General:

Work shall be done in co-ordination with civil work and to suit final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No. 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm. Adequate use



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of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All the bends shall be done with Bending Spring.

Concealing of conduits: in RCC work

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed on steel of RCC work by binding wire. Fixing of conduits shall be such that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers / sockets at ends and be flush with bottom of beam, and at located at the center of the beam. As per as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through in the conduits for drawing of wires later on.

Concealing of Conduits: In walls

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the surface shall be done. Conduits of adequate size shall be erected with use of appropriate accessories and 'U' nails.

Drawing of wires:

Use of Steel fish wire shall be made for drawing of wires. Wires shall be drawn with adequate care. Correct colour coding shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped within circuit only. For lighting load distribution, wires of two different phases shall not be drawn in single pipe. Wires shall be terminated in the terminals of accessories only. Adequate extra length shall be left at termination points. In case of 2-way point wiring additional wires of phase conductor shall be provided between the 2-way switches.

Fixing Switchboards and accessories:

Control switchboards shall generally be erected at 1.35m height or as specified and fixed with minimum 2 Nos. of screws of length not less than 50 x 8mm, Boards shall be in line and plum and shall be in level with wall surface so as to fix mounting plate flush with wall, Termination of wires shall be done in switch and other accessories only by carefully inserting all strands in terminals and proper tightening. Switches shall be provided on phase wire only. Bare wire shall not be used for looping incoming supply to switches. Phase wire shall be routed through switch only. For plug socket phase wire shall be connected in right side terminal when seen from front. Proper termination of earth wire in Earth terminal shall be ensured. All blank modules shall be plugged with blanking plates.

Testing:

Insulation resistance test:

All wiring shall be tested with 500V Meggler between phases, phase-neutral and to Earth. IR value shall not be less than 1M-ohm.

Earth continuity:

Earth continuity shall be ensured at all earth terminals of plug outlets and at earth terminals of metal enclosures.

Polarity test:

Polarity test shall be carried out for ensuring the correct polarity in the plug.

Mode of Measurement:



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Measurement shall be carried out on the basis per number of points, for the point length up to 6 metre between switch and outlet. For the length exceeding 6 metre 10% of overall rate shall be added for every 1 metre.

Measurement for light / fan/ exhaust fan / 5A plugs / call bell point shall be carried out on the basis per number of points, as under:-

Short Point : up to a circuit length of 3 metre.

Medium Point: for circuit length greater than 3 metre and up to 6 metre.

Long Point : circuit length greater than 6 metre and up to 10 metres.

In case of power point measurement for long point is same as above and EL-I = > 10 metre but up to 15 mtrs.

EL - II = > 15m but up to 20m.

EL - III = > 20m but up to 25 mtrs.

Above 25 mtrs length measurement, the extra length will be taken in respective circuit measurement.

Note 1: Cu – applicable to only copper cable; Al – applicable to only Aluminium

Note 2: the table shows maximum capacity of conduits for the simultaneous drawing of cables. The columns headed 'S' apply to straight runs of conduits which have distance not exceeding 4.25m between draw in boxes and which do not deflect from straight by an angle more than 15 degrees. The columns headed 'B' apply to bent runs of conduit, which deflect from the straight by an angle of more than 15 degrees.

Note 3: In case of inspection type draw in box has been provided and if the cable is first drawn through one straight conduit, then through the draw in box and then through the second straight conduit. Such system may be considered as that of straight conduit even if the conduit deflects through the straight by more than 15 degrees

Distribution Board Suitable for MCB's (MCBDB)

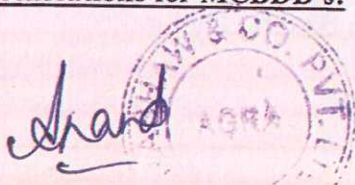
Horizontal/ vertical type DBs

Scope:

Specification No (SW-SWR/MDB)

Supplying of MCBDB suitable for 230V /415 V, horizontal/vertical, with/without door of specified ways (poles), surface/ flush mounting to house incoming and outgoing MCB's and erected on iron frame.

General specifications for MCBDB's:



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- DB's shall be prewired and shall be fabricated as per IS:8623.
- Suitable for flush mounting & surface mounting, with 100A copper bus bar (For horizontal type DB), neutral bar, earth bar 7 cable ties for cable management.
- In case of vertical DB the bus bar shall be of 200A rating.
- All the MCB distribution boards shall be fabricated out of 18 SWG thick sheet steel duly rust inhibited through a process of degreasing, pickling, phosphating & powder coating to an approved colour over primer & shall be of the totally enclosed dust proof type suitable for wall mounting.
- All components shall be mounted on DIN rails & covered totally with a sheet steel cover rendering it finger safe. Access to the internal connections shall be only through removing the cover sheet.
- All the DB's shall be internally prewired using copper insulated high temperature PVC wires.
- Bus bars & neutral bar shall be fully insulated with standard colour code.
- DB's must have facility of reversing door without modification, pan assembly for ease of installation & convertible locking.

Material:

Horizontal / Vertical type MCBDB: ISI marked as per IS 8623 of specified ways (poles), surface/ flush mounting, with /without door, suitable for 230V /415 V.

Lugs: Copper lugs of suitable size as per (CB-CL/CU) in chapter 7.10 for cable

Iron work: Suitable size of angle/ flat

Hardware: SM screws, rawl plug, gutties, etc.

Method of Construction:

MCBDB shall be erected at designated location and directed by site engineer and terminating the provided wires by copper lugs (crimping type) and connecting the same.

Mode of Measurement: Executed quantity shall be counted on number basis. (ie each)

11KV SWITCHGEAR PANEL

1.0 The scope of these Specifications covers the Design, Engineering, Manufacture, Assembly, Testing at Manufacturer's works, Supply and Delivery at site of Switchgear Panel with 33 kV (Earthed) Indoor Vacuum Circuit Breaker (VCB), suitable for Feeder, Transformer and Bus coupler - with all accessories, auxiliary equipment and mandatory spares, described herein and, required for the satisfactory operation.

2.0 The switchgear panel shall conform, in all respects, to high standards of engineering design, workmanship and to the latest revisions of relevant Indian/International Standards, as prevailing at the time of offer. The purchaser shall have the right to reject any work or material, which, in his judgment, is not in full accordance therewith.

3.0 STANDARDS:




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The switchgear shall conform to the latest revisions and amendments thereof, of the following Standards, in all their parts & sections:

1. IS/IEC 62271-1/IEC 62271-1: High Voltage Switchgear and Control gear – Part 1: Common Specifications
2. IS/IEC 62271-100/IEC 62271-100: High Voltage Switchgear and Control gear – Part 100: Alternating-current Circuit Breakers
3. IS/IEC 62271-200/IEC 62271-200: High Voltage Switchgear and Control gear – Part 200: AC Metal Enclosed Switchgear and Control gear for rated voltages above 1kV and up to and including 52kV
4. IS 3427: A.C. Metal Enclosed Switchgear and Control gear for rated voltages above 1kV and up to and including 52kV
5. IS 10118: Code of Practice for Selection, Installation and Maintenance of Switchgear and Control gear
6. IS 12729: Common High-Voltage Switchgear and Control Gear Standards
7. IS 13516: Methods of Synthetic Testing of High Voltage Alternating Current Circuit-breakers
8. IS 11955: Preferred Current Ratings
9. IS/IEC 60060/IEC 60060: High Voltage Test Techniques
10. IS/IEC 60071/IEC 60071: Insulation Co-ordination
11. IS/IEC 60529/IEC 60529: Degrees of protection provided by enclosures
12. IS/IEC 60270/IEC 60270: High – Voltage Test Techniques – Partial Discharge Measurements
13. IS 9582: Specifications for Single-phase Electric motors for definite purpose
14. IS 996: Single-phase AC industrial motors for general purpose
15. IS 4794: Push-button switches
16. IS 11353: Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals
17. IS 5578: Guide for marking of insulated conductors
18. IS 2705: Specifications for Current Transformers
19. IS 3156: Specifications for Voltage Transformers
20. IS 3231: Electrical relays for power systems protection




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21. IS 1248: Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories
22. IS 2099: Bushings for alternating voltages above 1 000 Volts
23. IS 2629: Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
24. IEC 60044/IEC 61869: Instrument Transformers
25. IEC 60255: Measuring relays and protection equipment
26. Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010.

3.0 AUXILIARY POWER SUPPLY:

The Indoor switchgear panels shall be suitable for operation on the following auxiliary supply systems:

- i) Closing Circuit: 24V DC
- ii) Tripping Circuit: 24V DC
- iii) Indication Circuit: 24V DC
- iv) Alarm/Annunciation Circuit: 24V DC
- v) Protection Circuit: 24V DC
- vi) Auxiliary Relay Circuit: 24V DC
- vii) Spring Charging Motor Circuit: 230V AC, Single Phase, 50Hz.
- viii) Space Heater Circuit: 230V AC, Single Phase, 50Hz.
- ix) Cubicle Illumination Circuit: 230V AC, Single Phase, 50Hz.

The above supply voltage may vary as below and all devices shall be suitable for continuous operation over entire range of voltage:

1. AC supply: Voltage - +/- 10%; Frequency - +/- 5%
2. DC supply: Voltage (-) 15% to + 10%; Isolated two wire system

4.0 COMPATABILITY WITH SCADA SYSTEM:

The following features should be incorporated in the Indoor Vacuum Circuit Breaker panels so as to be compatible with the SCADA system:

Sl	Feature	Provision to be made available
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1	ON/OFF Status of the Breaker	2 N.O. + 2 N.C. contacts of the Breaker Auxiliary Switch or of the Breaker Auxiliary Contacts Multiplication Contactor, shall be wired upto the terminal block.
2	Local/Remote Switch Position	1 N.O. contact for Local Position Selection & 1 N.O. contact for Remote Position Selection, shall be wired up to the terminal block.
3	Spring Charged Status	1 N.O. contact of the Spring Limit Switch, which closes, when the closing spring is fully charged, shall be wired up to the terminal block
4	Breaker stripped on Fault Status	1 N.O. contact of the main numerical protection relay – configured to operate for the master trip (lock-out) element of the relay, shall be wired up to the terminal block
5	Voltage	Voltage Transformer output – 3-phase & neutral wires, shall be wired up to the terminal block.
6	Current	Current Transformer output – 3-phase, shall be wired up to the terminal block.
7	Tri-vector Meter Data	From the RS 485 Port provided in the Tri- vector Meter, over MODBUS Protocol. RS 485 Ports of the Individual Panel Tri-vector Meters, in various feeders of the Switchboard can be connected in daisy chain, with the last (terminal) panel's Tri- vector Meter's RS 485 Port left open for connecting the cable for SCADA. Daisy Chaining of the Trivector Meters or the supply of cables for daisy chain, cables for connecting to SCADA, etc. not in the scope of this tender.

5.0 BUSBARS:

5.1 Bus bars shall be designed and placed with adequate phase/ground clearances. If it is insulated and tubular busbar, then it has to withstand 170 kV(peak) and 70 kV (rms) for 1 min.

5.2 Bus Support insulator shall be flame-retardant, track resistant type, with high creepage surface.

5.3 All buses and connections shall be supported to withstand stresses due to maximum short circuit current and also to take care of any thermal expansion.

5.4 Bus bars shall be colour coded for easy identification.

6.0 SWITCHGEAR:

6.1 The Switchgear panels shall consist of a withdrawable truck type vacuum circuit breaker. It shall be metal clad type, with earthed metallic partitions between the compartments.



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6.2 Facility of lifting hooks of sufficient strength, welded firmly at the top, to lift the panel with VCB, during transport and erection - shall be provided.

6.3 The switchgear shall be of floor mounted type, with roll on floor breaker truck only.

6.4 The breaker compartment is to be separated from the bus bar and cable compartment by MS plate. The shutters shall in such way that it can be operated smoothly, automatically by the movement of truck. The shutters are of solid closing type, which close automatically, when the truck is withdrawn and cannot be pushed open inadvertently, when the truck is removed.

6.5 Spring charging shall take place automatically after each breaker closing operation. And, one Open-Close-Open operation of the circuit breaker shall be possible after failure of power

Miniature Circuit Breakers (MCB)

SP/SPN/DP/TP/FP/MCB's

Scope: Specification No (SW-SWR/MCB)

Supplying MCB of specified poles, current rating and either of B or C series with required wiring connections & lugs etc. and erecting in provided enclosures/ distribution board.

General specifications for MCB's

- MCB's shall be of current limiting type, ISI marked confirms to IS 8828-1996.
 - The power loss per pole shall be low and shall be in accordance with IS 8828-1996.
 - All cable entries shall be either from bottom or top.
 - MCB's shall be of C- curve characteristics & shall have quick make & break non-welding self wiping silver alloy contacts for 10 kA short circuit both on the manual & automatic operation.
 - All the active, live parts of MCB's should be out of human reach, ensuring safety & confirms to IP:55 degree of protection.
 - The MCB's must house transparent label holder to ensure circuit identification.
 - The MCB's must have fully insulated safety shutters.
 - The MCB's shall have lockable switching lever.
 - The Minimum electrical endurance shall be 20,000 operations.
 - The housing of the MCB shall be mounted self-extinguishing DMC (Dough Moulding Compound).
- The short circuit Current shall be brought to zero within 4 to 5 milliseconds from the time they are established.

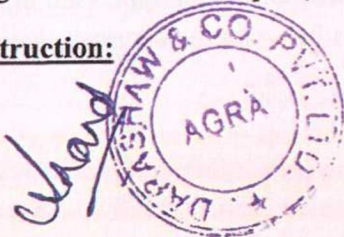
- All the MCB's shall have a minimum short circuit Capacity of 10 kA RMS

Material:

Single pole / Single pole with Neutral / Double Pole / Triple pole/ Four pole: MCB, ISI marked as per IS 8828-1996 (IEC 60898) with hammer trip and watch mechanism 15 arc plates, 10 kA capacity with nominal rating of 240/415V.

Lugs: Copper lugs of suitable size as per (CB-CL/CU) in chapter 7.10 for cable

Method of Construction:



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MCB shall be erected in provided enclosures/ distribution board and terminating the provided wires by copper lugs (crimping type) and connecting the same.

Mode of Measurement: Executed quantity will be counted on number basis. (i.e. each)

Fittings (FG)

Fans (FG-FN/CF)

Ceiling Fans:

Scope:

Specification No (FG-FN/CF)

Supplying and erecting ceiling of specified sweep with all accessories and necessary materials, erected in provided hooks/clamp.

Material:

Ceiling Fan:

Electric ceiling fan capacitor type with double ball bearing complete with capacitor, 300 mm down rod, canopies, shackles reel insulator, half threaded bolts of 9.53 mm (3/8") dia 62.5 mm (2-1/2") to 88 mm (3-1/2") long and 7.94 mm (5/16") dia 44.5 mm (1-3/4") to 57 mm (2-1/4") long with nuts, with lock type split pin, spring & washers, etc: three number blade made of Aluminium alloy, suitable for single phase, AC210 volts, 50Hz supply and conforming to class I of IS: 374/1979 with amendment no 1 to 6 except for performance parameters to the extent modified as details in general requirements. The down rod shall be capable to withstand a tensile load of 1000 kg without breakdown and a torsion load of 500 kg. Cm without breakage as per clause

10.14.1 of IS: 374/1979 with amendment no.1 to 6. Electrical motor should be single phase permanent capacitor type with no. of poles 12/14/16/18 (As per sweep), class -I with basic insulation shall be B class. The winding wire used for fan should be synthetic enameled of 30 to 38 SWG.

Connection Wire: Flat / round Two core flexible stranded copper wire cord 24/0.2 mm ISI marked.

Paint: Superior quality enamel paint of specified colour for marking Sr. No and date of erection.

Table 2.6/1

Performance parameters for Fans suitable for rated voltage

S. No	Sweep	Maximum input power in watts	Air delivery in m ³ /minute	Minimum Service Value
			At rated Voltage	At 180V
1	900 mm	42	140	3.4
2	1200 mm	50	215	4.3
3	1400 mm	60	270	4.5



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Method of Construction:

Blades of ceiling fan shall be properly fixed. Down rod, shall be carefully fixed with bolt spin pin. Canopies shall be tightened on down rod keeping sufficient clearance. Wiring connections shall be made with required wire leads. Regulator of fan shall be erected on provided switchboard with required wire leads. Regulator of fan shall be erected on provided switchboard with required wire leads.

Testing:

After erection fan shall be tested by connecting to supply at all positions of regulator. Also steadiness of fan shall be checked at full speed, so that there is no wobbling.

Mode of measurement: Executed quantity shall be counted on number basis (i.e. each).

Mirror Light Fitting Suitable for CFL 9 watts

Scope:

Specification No (FG-IDF/ML2)

Supplying and erecting Mirror light fitting with 1x9 Watts CFL, with necessary Choke & accessories complete erected on polished wooden / sunmica block

Material:

Fitting:

Channel fabricated from CRCA MS sheet and finished in reflector white inside and outside. Pre-wired with vacuum pressure impregnated copper ballast, lamp holder and mains connector, and an aesthetically appealing serrated / reeded opal diffuser held in position by decorative end covers white (W) / deep blue (B) / orange (O) / H.C. grey (G), post office red (R)/ Black (BK) or approved colour, 12mm dia grommet. Two 6.5 mm dia holes on the rear side of the channel to facilitate wall / ceiling mounting.

Wooden board: As per specified in chapter for Point wiring. (WG-PW/PW) .

Hardware: Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

Connection wire: Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

Terminal connector: As per (FG-FG/AS10) specified in chapter 2.4.

Method of Construction:

The fitting shall be mounted on polished Wooden / Laminated 4mm plywood top / block by required size of screws with necessary flexible wire for connection.

Mode of Measurement: Executed quantity shall be counted on number basis, (i.e. each)- 20,21

Tubular Fluorescent Lamps (TFL – as per BEE spec.)

Specification No. (FG-LP-TFL)



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Scope :

Supplying & fixing Tubular Fluorescent lamps for general lighting service suitable for 230volts ,& of specified wattage ,as per Indian Standard IS 2418(part 1)&(part2)-1977 including all the amendments. The lamp shall meet with the requirements mentioned in BEE specification

Material:

Lamp: This standard specifies the requirements for participating in the energy labeling scheme for Tubular Fluorescent lamps for General lighting service .1.2 The referred Indian Standard are IS 2418 (Part 1) & (part 2)-1977 including all the amendments. It shall covers 4 feet tubular fluorescent lamps for wattage upto 40W . and shall cover 6500K colour temperature for halophosphates and 6500K,4000K & 2700 K for tri-phosphate category.

Star rating plan:

Lumens per watt at 0100 hrs of use ≥ 61 & ≥ 67 & ≥ 86 & ≥ 92

Lumens per watt at 2000 hrs of use ≥ 52 & ≥ 57 & ≥ 77 & ≥ 83

Lumens per watt at 3500 hrs of use ≥ 49 & ≥ 54 & ≥ 73 & ≥ 78

The measured values will be converted to star ratings for each point i.e at 100 hours, 2000 hours,3500Hour & the average of the 3 ratings will be taken.This will be rounded of (<0.5 to lower level and $\Rightarrow 0.5$ to higher level)to the nearest integer which will be the star rating for the product.

- The product should conform to minimum requirements of IS 2418(part 1) & (part 2)-1977 to participate in BEE S&L programme.
- BIS product certification or at least , Quality Certification such as ISO-9000 should be required to participate BEE S&L Programme.

The star marking as per the rating is required to be stamped on the lamp. The size of the stamp for the star making is 14.5 mm height x 8.5 mm width. The same shall be stamped in a separate column.For example for a three star lamp the same need to be marked on the lamp as mentioned in IS 2418(Part 1) & (part 2)-1977 including all the amendments.

Method of Construction:

The lamp shall be fixed at specified location as directed by site engineer.

Mode of Measurement:

Executed quantity shall be counted on number basis.(i.e each)

LED Luminaries

Scope:



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Supplying and erecting approved make surface / recessed mounting indoor fitting of specified wattage to provide specified lux level at specified height with p.f.>0.95 complete as per manufacture's specification, with appropriate driver.

Material:

Fitting: Scientifically designed highly polished & anodized aluminum reflector ensures precise light control with optimum light utilization either with glass / frosted glass cover with ring or as per manufacturer's specification, leading to substantial savings in energy cost & excellent ambient conditions. Frame is fabricated from CRCA/MS sheet and epoxy powder coated white. Percolated frame ensure corrosion free life. Retaining clips for recess mounting fittings to facilitate mounting in false ceilings. Luminaries comprises of a deep drawn MS sheet canopy along with LED's with 100 lumens per watt mounted on top of aluminium heat sink of appropriate size for excellent thermal dissipation. The constant current driver circuit should be inside the luminary and can be driven between 80V to 260V. It should conform to class 1 of IS: 10322. Fitting shall be wired with multi stranded copper wire terminating on suitable connectors.

DRIVER: The constant current driver driven at 600mA of constant current should have short circuit protection, thermal protection & should work in the range of 80V to 250Volts.

LED's: The LED's of approved make having life of minimum 50000 burning hours, must have a color temperature between 5000-7000 and of 100 lumens per watt.

Metal Core PCB's: The PCB should be of metal core, copper clad laminate composed of 10Z electro deposit copper and 1.5mm 5052 aluminum alloy laminated by 60um high thermal conductive adhesive of modified epoxy.

Hardware: Sheet metal (SM) screws, washers, plugs / wooden gutties, etc.

Method of construction:

The fitting shall be fixed firmly in the designated place (false ceiling / unspecified ceiling) with the help of swinging bracket and making the connection. In case where fittings are to be installed flush with / on false ceiling layout shall be given to civil wing and work shall be done in co-ordination with civil wing e.g. making recesses in false ceiling.

Cable Joints & End Termination Kits

(LT Cables)(JT/LT)

1. Scope:

Specification No (CB-JT/LT)

Providing straight through cable jointing kit of approved make and jointing cable as per the manufacturer's instructions and duly marking name of jointer and date.



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2. Material:

Joint kit: Kit manufactured by reputed manufacturer with PVC moulds made in two parts, with epoxy compound, earth continuity lead of appropriate cross section having lugs at both ends, aluminum ferrules of the size of the cable, cross shaped epoxy spacer, MS clips for holding the moulds, adhesive for pasting the moulds.

3. Method of Construction:

3.1 Straight through joint Kit: LT Cables

Before providing joint to the cable, the cable ends of the equivalent length of the joint moulds, shall be prepared by removing the outer PVC insulation along with the steel armouring. The ferrule shall then be inserted over the bare core of the cable, and shall be crimped with hydraulic / mechanical type heavy duty crimping tool. The crimped portion shall be wrapped first with the PVC insulation tape and then with the insulation tape used for wrapping HT conductor. The above method shall be carried out for all the cores strictly following the colour code. The leads of the both the cables now shall be placed into the mould by using the epoxy spacer, for having sufficient gap in-between the leads. The earth continuity lead shall be clamped to the both ends of the cable. After covering the cable -leads with the PVC moulds, the edges shall be clipped after applying the adhesive on the inside face of the moulds. The pasting of moulds shall be rigid and as far as possible leak proof, so that the epoxy compound shall not spill out. Now the duly stirred epoxy compound shall be poured and fill till the compound rises through the risers provided on the moulds. After completing the above procedure, the joint shall be allowed to dry out for at least 8 to 10 hours (for epoxy compound to get hardened) depending upon the size of cable. Before connecting to supply, the dry and hardened joint shall be tested for its insulation level with 1000 V/5000 V Meggar.

The cable should be fixed or laid in such manner that there should not be pressure on end of moulds or on jointing position of cables. (Refer drawing No. CB-JT-1)

LT PANELS

Scope

This specification covers design, manufacturing assembly, testing at works, packing & delivery of sheet steel enclosed, compartmentalized self standing indoor mounting LT panel Boards and Outdoor Type Feeder Pillars. The supply of switchgear shall be in the scope of the Client. The Control gear, Capacitors, Wiring of Capacitors and Instrumentation shall be in Panel Builders scope as per the Single Line Diagram. The Sub Energy metering has to be proposed only for 3phase loads.

1.0 Standards



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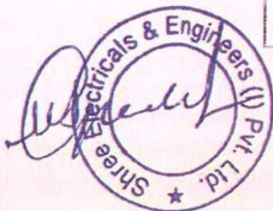
Unless otherwise specified elsewhere in this specification, the design, construction, manufacturer and performance of the LT Distribution boards shall conform to latest revisions of all relevant standards.

All the Electrical switchboards/ Panels / Distribution Boards shall comply with: IEC 61439

A list of some of the standards is enclosed below

Sr. No.	IS No	Title
1	IS : 2516	L T Circuit Breaker
2	IS : 4064	Air Break Switch
3	IS : 375	L. T. Bus Bars
4	IS : 4237	General requirements of switchgear
5	IS : 13924 (PART 1 & 2), IS : 9224 (PART 1 & 2), IEC 269 1 & 2.	H.R.C. fuses – LOW LOSS
6	IS 2147: 1962/ IEC60529	Enclosure for switchgear
7	IS : 6875	Push Buttons
8	IS : 13947 (PART 4) Sec – 1.	Contactors
9	IS : 3842	Thermal Relay
10	IS : 2705	Current Transformer
11	IS : 3156	Voltage Transformer
12	IS : 1248	Indicating Instruments
13	IS : 3618/6005	Phosphating of M.S.Sheets
14	IS : 5082	Aluminum Bus Bars
15	IS : 13947 (PART 3), IEC 947 – 3	SDF
16	IS : 8828 (PART 2) IEC 898	MCB
17	IS : 13947 (PART 2) IEC – 2	MCCB

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18	CE	APFC
19	IS : 5553, IEC 76 / 3, VDE 0532	REACTOR
20	IS: 2834 – 1986, IEC 831 – 1, IEC 831 – 2.	CAPACITORS

General Technical Requirement

The general Technical Requirement of the LT Panel Boards are furnished below :

1.1 Constructional Features

1.1.1 The board shall be sheet steel enclosed, indoor, floor mounted modular, self supporting type made up of the requisite vertical sections.

1.1.2 It shall be dust & vermin proof with a degree of protection of IP-52.

1.1.3 It shall be possible to extend the board on both sides by addition of vertical sections after removing the end covers. Construction shall be modular type. It is to be engineered to accommodate all switchgears for individual operations. Structure shall be of rigid / bolted constructions with CRCA steel sheet of 2.5 mm thickness for front/back/side panels/doors. Barriers/partition shall be made up of 2.0 mm CRCA sheet

1.1.4 A metal steel frame made of M.S. Channel of 75 x 40 mm ISMC shall be provided as base frame, properly drilled for mounting the board. Necessary hardware shall also be provided for the same.

1.1.5 It shall be provided with cable entry at bottom with 3 mm removable gland plate of adequate dimensions.

1.1.6 The board shall be of uniform height of not more than 2100 mm (PCC 1), 1500mm (Feeder Pillars) and it shall be of single front execution. It shall be provided with bus bars running at top for the PCC 1. The cable entry shall be from bottom along the length of the board in separate sheet steel enclosure. The board shall be provided with gasket all round including removable covers & doors. All the operating devices shall be provided only on the front of the board. The back side of the panel shall be provided with open able doors for ease of termination and maintenance.

1.1.7 The height of the top most operating handle shall not be more than 1800 mm and that of the bottom most operating handle shall not be less than 600 mm. The board shall be divided into distinct sections comprising of-

- metal enclosed bus bar compartment running horizontally
- Individual feeder modules arranged in multiplier formation.



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- c) Enclosed vertical bus bars serving all modules
- d) Vertical cable alley covering entire height

Metal sheet shall be provided between two adjacent vertical sections running to full height of the board. Bottom cable entries shall be provided, with removable gland plate. The gland plates shall be as per the dimension of the cable outgoing marked in the SLD.

1.1.8 All equipment associated with a single circuit shall be housed in a separate module compartment. The compartment shall be sheet steel enclosed on all sides and rear. A plate cover with a slot to permit wiring connections shall be provided on the side corresponding to the cable alley. The front of the compartment shall be provided with hinged door.

1.1.9 All doors, cable alley, bus-bar chamber covers etc should be provided with neoprene gasket suitably adhered to door. Ventilation louvers with wire mesh. Ventilation louvers behind I/C ACB shall be provided with cooling fans – for exhaust as shown in the drawing. Temperature indicator and controller shall operate the fans. The sensor shall be suitably embedded in the bus near to the Main ACB.

1.1.10 Only the handles of switches, push buttons knobs and cutouts for lamps & meters shall be arranged on front of the respective compartment to permit operation without opening the door. All cutouts shall be gasketed for dust proofing. Bus bar chamber and cable Alley should have bakelite protective covers to prevent inadvertent access to live bus-bars / cable termination on opening covers. Provision of Light point with a toggle switch to be provided in each cable alley. The location of the toggle switch shall be at a safe distance.

1.1.11 Cable alley shall be provided with suitable hinged door. Vertical bus bar compartments shall be provided with adequate shrouding & bolted covers.

1.1.12 Rear of the board shall be provided with removable panels.

1.1.13 All doors shall be provided with concealed type hinges and captive screws.

1.1.14 All identical equipment and corresponding parts of similar ratings shall be fully interchangeable.

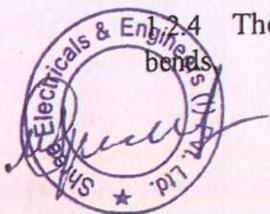
1.2 Sheet Metal Work

1.2.1 The board frame shall be fabricated using pressed & shaped CRCA sheet steel of minimum 2.5 mm thickness.

1.2.2 The Board shall be enclosed by sheet steel of minimum 2.0 mm thickness smoothly finished & leveled. Doors & covers shall be made of 2.00 mm thick sheet steel. Adequate stiffeners shall be provided wherever necessary.

1.2.3 All panel edges and door edges shall be reinforced against distortion. Cut outs shall be true in shape and devoid of sharp edges.

1.2.4 The complete structure shall be rigid, self supporting free from vibration, twists &



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1.3 Painting

All sheet steel work shall be phosphate in accordance with the following procedure.

1.3.1 Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning.

1.3.2 Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

1.3.3 After phosphating, through rinsing shall be carried out with clean water, followed by final rinsing with dilute dichromate solution and oven drying.

1.3.4 The panel then shall be painted with an approved color shade as per IS. The final finished thickness of paint film on steel shall not be less than 60 microns, and shall not be more than 80 microns.

1.3.5 Finished painted appearance of equipment shall present an aesthetically pleasing appearance, free from dents and uneven surfaces.

1.3.6 All Panels shall be powder coated and with 7 tank process.

1.4 Main Bus & Taps

1.3.1 The board shall be provided with three phase and neutral bus bars. The bus for phase and neutral shall be of the same rating.

1.4.2 Busbars shall be of uniform cross section throughout the length of the board, and up to the incoming terminals of feeder circuit breaker / switch.

1.3.3 The busbars shall be made of high conductivity aluminum alloy of E91E grade. Copper bus shall be used where specified.

1.3.4 Busbars shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents. Busbar supports shall have test methods as per BS : 2782 and Dielectric Strength - BS-2782- PARTS2-201C and test certificates shall be submitted.

1.3.5 Separate supports shall be provided for each phase of the busbars. If a common support is provided for all three phase, antitracking barriers shall be incorporated.

1.3.6 Busbar joints shall be complete with high tensile steel bolts and washers and nuts. Busbars shall be thoroughly cleaned at the joint locations and a suitable contact grease shall be applied just before making a joint. Sandwiching of Bus has to be proper and by passing full rated current temperature rise test shall be carried using infrared gun.

1.3.7 All metering components of LT Panels must be compatible for SCADA connectivity.

1.3.8 Specification of Electrical Items in compliance with ASCL DC/ICCC.



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Bidder has to provide the SCADA, DMS and OMS for real time monitoring & control of the distribution system, loss minimization/load balancing and considerable improvement in voltage/VAR profiles. Proposed SCADA system shall monitor, operate and control operations in mentioned substation and DTs. Bidder shall study and propose any other gap infrastructure/hardware related to implementing the Electrical SCADA, DMS and OMS in above specified locations. MSI shall Study and implement the motorization of all the RMU sub-station of 33/11 KV, 11/0.433 KV). The RMU drawing is provided in **Annexure A**.

Sr#	Requirements
Power Requirement Standard Compliance for Data Centre /ICCC	
1.	<p>Bidder need to ensure below mentioned requirement towards compliance of their scope of work. ASCL reserves right to get third party audit for Uptime Tier III/ Tier IV standards or TIA 942 power requirements of data centre. Bidder will be required to do all necessary coordination and documentation at no additional cost for ASCL to ,for third party audit and certification where as the cost will be borne by ASCL. for such audit</p> <p>The fundamental requirement:</p> <ul style="list-style-type: none"> a) A concurrently maintainable data center has redundant capacity components and multiple independent distribution paths serving the critical environment. For the electrical power backbone and mechanical distribution path, only one distribution path is required to serve the critical environment at any time. <p>The electrical power backbone is defined as the electrical power distribution path from the output of the on-site power production system (e.g. engine generator, fuel cell) to the input of the IT UPS and the power distribution path that serves the critical mechanical environment. The mechanical distribution path is the distribution path for moving heat from the critical space to the outdoor environment .For example, chilled water piping, condenser water piping, refrigerant piping etc.</p> <ul style="list-style-type: none"> b) All IT equipment is dual powered with a Fault tolerance* power design and installed properly to be compatible with the topology of site's architecture. Transfer devices, such as point-of – use switches, must be incorporated for critical environment that does not meet this requirement. c) Twelve hours of on-site fuel storage for 'N' capacity. d) Complementary systems and distribution paths must be physically isolated from one another to prevent any single event from simultaneously impacting both systems or distribution paths. <p><i>(*Fault tolerant has multiple, independent, physically isolated systems that provide redundant capacity components and multiple, independent, diverse, active distribution paths simultaneously serving the critical environment. The redundant capacity components and diverse distribution paths shall be configured such that "N" capacity is providing power and cooling to critical environment after any infrastructure failure.)</i></p> <p>The performance confirmation tests:</p> <ul style="list-style-type: none"> a) Each and every component and element in the distribution paths can be removed from service on a planned basis without impacting any of the critical environments.

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- b) A single failure of any capacity system, capacity component, or distribution element will not impact the critical environment. The infrastructure controls system demonstrates autonomous response to a failure while sustaining the critical environment.
- c) There is a sufficient permanently installed capacity to meet the needs of the site when redundant components and distribution paths are removed from service for any reason.
- d) Any potential fault must be capable of being detected, isolated, and contained while maintain N Capacity to the critical load.

The operation impacts:

- a) The site is not susceptible to disruption from the single unplanned activities and any planned work activities. Operation errors of site infrastructure components may cause a computer disruption.
- b) An unplanned outage or failure of any capacity system may impact the critical environment.
- c) An unplanned outage or failure of a capacity component or distribution element may impact the critical environment.
- d) Planned site infrastructure maintenance can be performed by using the redundant capacity components and distribution paths to safely work on the remaining equipment.
- e) During maintenance activities, where redundant capacity components or a distribution path shut down, the critical environment is exposed to an increased the risk of disruption in the event a failure occurs on the remaining path. The maintenance condition does not defeat the Tier rating achieved in normal operations.
- f) Operations of the fire alarm, fire suppression, or the emergency power off (EPO) feature may cause a data center disruption.

2.

On-Site power Production Systems

Onsite power production systems must automatically start and assume load upon the loss of Utility. In addition, all critical equipment not backed up by UPS power must be autonomously restarted after the power is restored. Although engine generators are only one solution for onsite power production, the nuances of the ratings dictate additional commentary to describe the specific requirements that must be met when using an engine generator system for on site power production.

- i. Engine generator system (EGS) along with its power paths and other supporting elements, shall meet the concurrently maintainable and /or fault tolerant performance confirmation tests while they are carrying the site on EGS.
- ii. Engine generators shall not have a limitation on consecutive hours of operation when loaded to 'N' demand.
- iii. EGS often have an annual regulatory limit on operating hours driven by emissions. These environmental limits do not impact the consecutive hours of operation constraint.



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