

**TENDER DOCUMENT FOR ELECTRIFICATION, OF  
AUDITORIUM AT SPIRITUAL GROWTH CENTER , KATRA.**

**GENERAL ELECTRIFICATION WORK**

**KLM DESIGNS INDIA**

**C-79, BASEMENT  
MALVIYA NAGAR  
NEW DELHI -110017  
TEL – 41831089-99**

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### ANNEXURE A: NIT AND GENERAL INSTRUCTIONS

SMVDSB intends to appoint an Eligible contractor for General electrification work at auditorium in SPRITUTAL GROWH CENTER complex.

The above-mentioned work shall be carried out as per schedule of quantities and specifications.

Only those tenderers who are experienced in the specialized works and have qualified staff shall only be eligible to tender.

#### **1.1 QUALIFICATION FOR ELIGIBILITY TO TENDER:-**

The tenderer should be specialist in the field of works as defined in item no 1.0 and should have completed at least two similar types of works during last Three years of not less then 5 lacs (**FIVE Lacs**) value. For which the tenderer shall have to produce supporting documents giving date of award, date of commencement/Completion certificate etc from the concerned competent authority in proof there of. **Tenders shall be issued only to the eligible contractors meeting the criteria.**

#### **2.0 PROCEDURE OF TENDERING**

The procedure for submission of tender document is as follows which should be strictly followed and no deviation in the procedure will be accepted.

- a) Submission of technical bid & financial bid.
- b) Conferencing with the bidders for technical discussions.
- c) Financial bids of only those contractors shall be opened who meet the laid down technical specifications.

### **3.0 SUBMISSION OF TECHNICAL BID: -**

The following documents should be submitted in two sealed envelope super scribed as "Technical bid " & " Financial bid" in separate cover which should reach this office on or before ----- at -----.

- a) Both these sealed envelopes should be kept in a third envelope and sealed and super scribed as "Technical bid with EMD".
- b) List of similar type of jobs executed in the past and certificate with date of having successfully completed from concerned competent authority in proof there of.
- d) Technical leaflets of important material proposed to be used.
- e) Copy of latest income tax returns submitted in the income tax department.
- f) Qualification of the bidder.
- g) Year of establishment of the firm.
- h) Details of technical staff in the firm.
- i) P.F registration/Sale tax registration nos/ Work contract tax no supported by the certificates from the respective Govt. Department.
- j) The Tenderer shall be registered with service tax department
- k) Details of the project undertaken supported by work orders and successful completion of the projects.
- l) Deviations from the commercial technical specifications to be spelled out separately giving reasons for such deviations. However, acceptance of these by the competent authority depends on the Consultants/owners decision.
- m) The sub-contractor for particular work if desired by the Principal contractor shall be appointed only after prior approval if the authorities.
- n) The rates of items quoted shall be inclusive of all taxes.
- o) SMVDSB reserves the right to cancel /reject any tender without assigning reasons.
- p) The Owner reserves the rights of accepting the whole or any part of a tender received and the tenderer shall be bound to perform the same at the quoted rates.
- q) Tenderer shall submit last years audited balance sheet
- r) Tenderer shall deposit earnest money of Rs \_\_\_\_\_ by Demand Draft only in favor of \_\_\_\_\_ Payable at \_\_\_\_\_. No other means of payment shall be accepted.

### **4.0 FINANCIAL BID: -**

The documents to be submitted with financial bid are as follows:

- a) The contractor should give his Rates both in figures and in words duly filled in the bill of quantities in a separate sealed envelope super scribed as "FINANCIAL BID".
- b) All entries (individual rates, sub-totals & grand totals) should be filled in English alphabets and Arabic numerals only either typed or clearly hand written by ballpoint pen. All correction if any made by the bidder should be initialed as many times as corrected.
- s) On tender scrutiny, if difference is found in rates given by the bidder in words and figures in individual rates or in sub-totals or in grand totals the procedures for deriving the final value shall be as follows.
- d) The item rates quoted by bidder shall be taken as correct in cases where amount worked out of any item does not correspond to the rates written in figures or words.
- e) For items where the bidder has not written item rates the highest rates quoted shall be taken as correct for such items for loading purposes and lowest rates for execution purposes.
- f) Bids can be sent by registered post at the risk and responsibility of the bidder. Any bids received after the time and date of submission of bids shall not be entertained.

- g) Before submission of the bids, the bidders are advised to visit site and get acquainted with site conditions, availability of materials/labour. All clarifications must be sought by the bidders well in time and no extension of time shall be given on this account.
- h) The bidders are advised to account for any fluctuations in market rates of material/equipment cost/labour rates. Any claims on these accounts shall not be entertained after the award of work unless specifically agreed to.
- i) Bids not submitted on prescribed form is liable to be rejected. Bidders are advised to quote original offer as per bill of quantities.
- j) In case drawings and details are not enclosed with tender documents, these can be seen in the office, not availing this shall not relieve the bidder of his responsibility of correct interpretation of work involved. Bidders who resort to canvassing in any form shall be liable for rejection.
- k) Bidder also has to submit shop drawings & as built drawings for approval of the consultant.

#### **5.0 PRINTED CONDITIONS OF CONTRACT:-**

Any printed conditions and conditions contrary to these conditions of contract in contractors offer shall be excluded from the contract and shall not be applicable to this contract.

#### **6.0 VALIDITY: -**

The tender shall be valid for acceptance for a period of 60 days from the date of submission of the tender.

#### **7.0 GUARANTEE:-**

The bidder should offer full guarantee of 12 months for complete work and equipments from the date of satisfactory handing over of the site as certified by the consultant/client after correction of faulty/bad workmanship, manufacturing defects in works. The tenderer shall guarantee the works to maintain quality on the basis of design/scheme. They shall also guarantee that the performance of the work executed shall meet the requirement as specified in work specifications.

#### **8.0 REPAIRS/REPLACEMENTS OF WORK DURING GUARANTEE :-**

Any defects or other faults which may appear within defect liability/guarantee period of one year satisfactory working conditions, arising in the system due to material or workmanship should be corrected and replaced with parts of original specifications and makes by the contractor at his own cost.

#### **9.0 FORCE MAJEURE**

Any delay in or failure of performance of either party hereto shall not constitute default hereunder or give to any claims for damages if and to the extent such delays or failure of performance is caused by occurrence such as Acts of God or the Public enemy; expropriation or confiscation of facilities by Government authorities, compliance with any order or request of any Governmental authority, acts of way, rebellion or sabotage or damage resulting therefrom, fires, floods, explosion, riots or illegal strikes. The Contractor shall keep record of the circumstances referred to above which are responsible for causing delays in the completion of work and bring these to the notice of the Engineer-in-Charge.

#### **10.0 Shop Drawings/ details**

The contractor to supply all shop drawings, wiring & cabling drawing as per site conditions for mounting of said systems within ten days of receipt of the

Order & further get them approved before starting the work.

#### **11.0 Descriptive Literature :-**

The tenderer shall supply a complete list with quantities of major items of equipments together with detailed descriptive literature including photographs and performance characteristics pertaining to the equipments offered. Manuals and instructions for operation and maintenance of all equipment and systems shall be supplied along with the equipment.

#### **12. Training :-**

The contractor shall train the operational staff so as to enable them to Operate/maintain the Sound-Lighting- Projection-Automation equipment in an Efficient /satisfactory manner. However the sole responsibility of the Equipment & subsequent handing over of the system to maintenance / Operational staff in a fully functional condition within the stipulated period Will rest with the contractor.

#### **13.0 Acceptance tests:-**

After installation ,testing & commissioning of the equipment performance measurement tests will be conducted to confirm that all the equipments meet the relevant technical specifications. The following tests will be done as a part of acceptance test by the Architects/Consultants or their authorised representative to take over the equipment :-

- a) Functional tests.
- b) Performance measurements of various parameters.
- c) 24 hrs. Endurance tests.

### **14. LABOUR REGULATIONS**

#### **14.1 Regulations**

The Contractor shall be wholly and solely responsible for full compliance with provisions under all labour laws and/or regulations such as Payment of Wages Act 1936, Minimum Wages Act 1948, Employees Liability Act 1938, Workman's Compensation Act 1923, Industrial Disputed Act 1947, the Maternity Benefit act 1961, The Contract Labour (Regulation And Abolition)Act 1970 and the factories act 1948 or any modifications thereof or any other law relating thereof and rules there under from time to time. The contractor shall assume liability and agree to indemnify the Owner from every expense, liability or payment by reason of the application of any labour law, Act Rules or regulations existing or to be introduced at a future date during the currency of the contract.

#### **14.2 Model rules**

The Contractor shall at his own expense comply with or cause to be complied with Model Rules for Labour welfare framed by Government or other local bodies from time to time for the protection of health and for making sanitary arrangements for workers employed directly or indirectly on the works and in the workers hutment area. In case the contractor fails to make arrangement as aforesaid, the Owner shall be entitled to do so and recover the costs thereof from the Contractor.

#### **14.3 Safety Code**

The Contractor shall at his own cost arrange for the safety provisions stipulated by Government or local authorities or as required by the Owner/Architect in respect of all labour directly employed for performance of the works and shall provide facilities in connection therewith. In case the contractor fails to make arrangements and provide necessary facilities as aforesaid, the Owner shall be entitled to do so and recover the costs thereof from the Contractor.

**14.4 Child Labour**

The Contractor shall not employ any labour under 18 years of age on the job. If female labour is engaged contractor shall make necessary provision at his own expense, for safeguarding and care of small children and keeping them clear of the site operations.

**15. ESI AND PF OBLIGATIONS**

The Contractor shall include in his rates all expenses towards meeting obligations under the employees State Insurance Act and the provident Fund Act. He shall follow all rules and regulations required under the Act as may be in force from time to time. The contractor shall cover all his workmen working at the site, under the ESI scheme and PF scheme, and directly the required amounts with the concerned authorities.

All records in connection with the above shall be properly maintained by the contractor and produced for scrutiny by Owner/authorities whenever called for.

**16. Contractor's Construction Manager And Other Staff**

The contractor shall ensure continued effective supervision with the help of a qualified, experienced and competent Engineer assisted by adequate staff as ascertained by the Owner/Architect , for the entire duration of the works. The contractor's construction Manager will be responsible for carrying out the work to the true meaning of the drawings, conditions of contract, specifications, schedule of quantities and Owner/Architect 's instructions and directions or instructions given to him in writing shall be held to have been given to the contractor officially. Attention is called to the importance of requesting written instruction from the Owner/Architect before undertaking any work where Owner/Architect 's directions or instructions are required. Any such work done in advance of such instructions will be liable to be removed at the contractor's cost. No staff including the Engineer and technical supervisory staff shall be transferred from the work without the written prior permission from the Owner/Architect .

**17. Security**

The contractor shall provide adequate number of watchman to guard the site premises, materials and equipment etc. at all times at his expense. The security of the entire site shall be the responsibility of the contractor.

**18. Telephone**

The contractor shall provide, install and maintain at his expense a separate telephone for the work. He shall pay all charges in connection with the same till the completion of the work.

**19. Work Sheds**

The Contractor shall provide, erect and maintain at his expense proper waterproof shed for the storage and protection of construction materials, equipment, both his own as well as those supplied by the Owner, if any, from time to time.

**20. Sanitary Convenience**

The contractor shall at his expense provide and erect all necessary convenience for the site staff and workmen, maintain them in a clean orderly condition and clean and deodorize the ground after their removal..

## **21. DEPOSIT**

Security deposit or Retention amount will be uniformly deducted from each running account bill @ 10%.

**22. ARBITRATION :** All disputes between the parties to the contract arising out of or in relation to the contract, other than those for which the decision of the Engineer or any other person is by the contract expressed to be final and conclusive, shall after written notice by either party to the contract to the other party, be referred to sole arbitration of the CEO, SMVDSB or his nominee. The arbitration shall be conducted in accordance with the provisions of the Arbitration and Reconciliation Act, 1996. The parties to the contract understand and agree that it will be no objection that the CEO, SMVDSB or the person nominated as Arbitrator had earlier in his official capacity to deal directly or indirectly with the matters to which the contract relates or that in the course of his official duties had expressed views on all or any of the matters in dispute or difference. The award of the Arbitrator shall be final and binding on the parties to this contract. In the event of the Arbitrator denying, neglecting or refusing to act or resigning or being unable to act for any reason or his award being set aside by the Court for any reason, it shall be lawful for the Managing Director or his successor, as the case may be, either to act himself as the Arbitrator or to appoint another Arbitrator in place of the outgoing Arbitrator in the manner aforesaid. The Arbitrator may, from time to time, with the consent of both the parties to the contract, enlarge the time for making the award. Work under the contract shall be continued during the arbitration proceedings. The venue of the arbitration shall be the place from which the contract is issued or such other place as the Arbitrator at his discretion may determine.

## **23. Law Governing The Contract**

This contract shall be governed by the Indian laws for the time being in force.

## **24. NOTICES**

All notices required under the contract, particularly those having financial implications shall be sent by parties at their address given in the contract, through registered post.

## **25. WORKS MATERIALS SPECIFICATINS**

### **GENERAL:-**

This part of the tender documents is to be read in conjunction with general conditions of contract, as applicable to civil work, electrical work and other allied jobs and other articles forming part of this document.

### **SCOPE OF WORK: -**

The work to be performed under these specifications includes all material, equipment, labour and services to install the wall/ceiling acoustic treatment, audio/video system and stage lighting extra as per the schedule of quantities.

**25.1** The work will include all necessary material, bolts, nuts, fasteners, nails, screws, wooden plugs, hangers, supports, sleeves and other attachments as may be required in the work

**25.2** For details of building construction refer Architect's and structural drawings.

**25.3** The tenderer is supposed to follow the manufactures instructions for material installation and the same shall be deemed to have been included in the scope of work.

**25.4** The work shall be co-coordinated with other contractors whose work may be affected or have an effect on the installation of the wall/roof insulation.

**25.5** All fixtures etc not specifically mentioned but are required for safety and finishing of work are deemed to be included and are to be carried out.

**26.6**The tenderer shall take a work insurance policy in favour of his labour. The client will not be responsible for any mishap etc at site.

**27.** Electricity & water will be provided at one point at site by client free of charge.

**28** All concealed/ exposed metal frames, cleats etc to be given two coats of red oxide Primer.

**29.** As the work is envisaged at the height the Contractor shall get a workman insurance & all work to be done as per the standard safety norms.

**30.** The tenderer to take care that no separate scaffolding/propping charges payable.

**31.**The wood being used shall be kiln dried & chemically treated.

## ANNEXURE B

### **32. SUMMARY OF VARIOUS CLAUSES**

1.	Defects Liability Period	12 Months from the date of successful completion of the job.
2.	Period of Final measurement	Immediately after the completion of the job and within two weeks of satisfactory handing over of the site.
3.	Date of Commencement	10 days from the letter of intimation
4.	Time of Completion	30 days
5.	Liquidated Damages	1% per week subject to max. of 10% of the contract value.
6.	Earnest money deposit	Rs. _____ in form of DD in favor of CEO, SMVDSB payable at _____

7. Security Deposit 10% of the bill amount from each running bill. The security deposit will be collected by deduction from the running bills of the contractor
8. Escalation No escalation on any account shall be payable to the contractor.
9. Extra Items As per the analysis on market rate and as decided by Project in-charge
10. Supply of Material All materials and equipment shall be installed only after prior approval and inspection of the Engineer In-Charge.
11. Taxes Income tax, work contract taxes shall be deducted as per rules and others as per prevailing rules shall be deducted from the bills.
- 12 : Release of retention money
- a) Half (50%) of the retention amount within 15 days from the date of virtual completion certificate.
  - b) Balance after 30 days from the date of virtual completion certificate and after discharge of defects liability.
13. Mobilization advance : 10% of the contract value, to be recovered on pro-rata basis @ 12 % of the corrected value of the interim bills and it will be completely recovered latest by the time 90 % of the work gets completed.
14. Sales tax, Income tax and any other taxes/duties/levies on work contract Shall be to contractor's account

## **ANNEXURE C : SPECIAL CONDITIONS OF CONTRACT FOR ELECTRICAL & FIRE ALARM SYSTEM**

Providing fixing and layout of electrical system unit including fixtures, wiring, cabling conducting fixing & connecting to the mains panel distribution boards, power points, light points and earthing system. The work to be coordinated with existing available system. The site may be examined and shop drawings prepared for approval from consultants & engineer in charge before taking up execution. The work to be carried out as per electricity safety rules and practices materials used shall be ISI approved only.

### **TECHNICAL SPECIFICATIONS**

#### **1.00 GENERAL SCOPE OF WORK**

The electrical scope of work covers the followings:

- a. Internal electrification through concealed/surface PVC conduit and provide light points and socket outlets as shown in the detailed drawings.
- b. Provide telephone outlets as shown in the detailed drawings.
- c. Provide Distribution panel at convenient locations to facilitate power for lights, fans, sockets, power plugs data points through UPS supply. UPS supply shall be separate..
- d. Provide Power distribution network including Panels, cabling, mains and sub-main wiring.
- e. Scope of work shall include supply installation, testing and commissioning of  
complete electrical installation
- f. Earthing of electrical installations complete in all aspects.

#### **2.00 REGULATIONS AND STANDARDS**

**2.01** The installation shall conform in all respects to Indian Standard Code of Practice for Electrical wiring installation IS:732-1963 and IS:2274-1963. It shall also be in conformity with Indian Electricity Rules and the Regulations, National Electric Code and National Building Code. CPWD specifications and requirements of the Local Electric Supply Authority. In general, all materials, equipment and workmanship shall conform to the Indian Standards, specifications and code. Some of the applicable codes/standards are as under:

- |    |                                                                                                             |                            |
|----|-------------------------------------------------------------------------------------------------------------|----------------------------|
| a) | Marking and arrangements for switchgear : Bus bars,<br>– 1963<br>main connection and auxiliary wiring.      | IS 375                     |
| b) | Specifications for enclosed distribution<br>1983                                                            | IS 2675 -                  |
| c) | Installation and maintenance of switchgear.<br>IS10118-1982<br>(Part-I)                                     |                            |
| d) | HRC cartridge fuse links 650 volts<br>1962                                                                  | IS 2208 -                  |
| e) | Specifications for PVC insulated (heavy duty) electric<br>cable Part-I for voltage upto 1100 volts.<br>1988 | IS 1554 -                  |
| f) | Specifications for PVC insulated: Cables for voltage<br>upto 1100V with Aluminium conductors.               | IS 694-1990                |
| g) | Specifications for Rigid Steel conduit for electrical<br>wiring.<br>1981                                    | IS 9537 -                  |
| h) | Specifications for accessories for rigid steel conduits<br>for electrical wiring.                           | IS 3837-1976               |
| i) | Boxes for the enclosure of electrical accessories,<br>Steel and CI boxes.                                   | IS 5133 - 1969<br>(Part-I) |
| j) | 3 pin plugs and socket outlets                                                                              | IS 1293 - 1988             |
| k) | General and safety requirements for electric lighting<br>fittings.                                          | IS 1913 - 1978             |
| l) | Electric ceiling fans and regulators.<br>1979                                                               | IS 374 -                   |
| m) | Code of practice for earthing<br>1987                                                                       | IS 3043 -                  |
| o) | electrical installation.                                                                                    | IS 1646 - 1982             |
| p) | Current transformers<br>1992                                                                                | IS 2705 -                  |
| q) | Direct acting electrical indicating instruments.<br>1983                                                    | IS 1248 -                  |
| r) | Factory built assemblies of switch gear & control gear.                                                     | IS 8623                    |
| s) | MCB                                                                                                         | IS 8828                    |

t)	MCCB 2516	IS
u)	SFU	IS 13947
v)	ELCB	IS 12640

### **3.00 INTERNAL ELECTRIFICATION OF BUILDING**

#### **3.01 SCOPE**

Under this head, the bidder is to carry out the internal electrification of the auditorium as mentioned under para 1.0.

The scope covered under this head includes concealed/surface conduiting, wiring, provision of distribution boards, submains/mains and fittings.

#### **3.02 GENERAL**

The electrical Installation work shall be carried out in accordance with Indian Standard Code of Practice for Electrical Wiring Installation IS: 732-1989 and IS: 2274-1963. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the Local Electricity Supply Authority and Fire Insurance regulations, so far as these becomes applicable to the installation. Electrical work in general shall be carried out as per following CPWD Specifications with upto date amendment.

- General Specifications for Electrical Works.

(Part I - Internal) - 1994.

Wherever this specifications calls for a higher standard of material and or workmanship than those required by any of the above mentions regulations and specification then the specification here under shall take precedence over the said regulations and standards.

#### **3.03 DISTRIBUTION BOARDS.**

Distribution Board shall be standard type as per the CPWD specifications. All distribution boards shall be of three phase (415 Volts) or single phase (240 volts) type with incoming isolator or MCB as in Schedule of quantities. Distribution boards shall contain plug in or bolted type miniature circuit breaker mounted on busbars. Miniature circuit breakers shall be quick make and quick break type with trip free mechanism. MCB shall have thermal and magnetic short circuit protection. MCB shall conform with IS 8828-1978. Neutral busbars shall be provided with the same number of terminals as there are single ways on the board, in addition to the terminals for incoming mains. An earth bar of similar size as the neutral bar shall also be provided. Phase barrier shall be fitted and all live parts shall be screened from the front. Ample clearance shall be provided between all live metal and the earth case and adequate space for all incoming

and outgoing cables. All distribution board enclosures shall have an etched zinc base stove painted followed by synthetic stoved enamel, colour light gray.

A circuit identification card in clear plastic cover shall be provided for each distribution board.

Miniature Circuit Breakers for lighting circuits shall be of "L" series where as 'G' series MCB's shall be invariably used for motor loads, halogen lamps fitting, sodium/mercury discharge lamps and for all power circuits. All miniature circuit breakers shall be of 9 KA rated rupturing capacity.

### **3.04 SURFACE CONDUIT.**

Conduit pipes shall be fixed by heavy gauge saddles, secured to suitable wood plugs or other approved plugs with screws in an approved manner at an interval of not more than one meter but on either side of the couplers or bends or similar fittings, saddles shall be fixed at a distance of 30cm from the center of such fittings. The saddles should not be less than 24 gauge for conduits upto 25 mm dia and not less than 20 gauge for larger diameter conduits. The corresponding widths shall be 19 mm & 25 mm. Where conduit pipes are to be laid along the trusses, steel joint etc. the same shall be secured by means of special clamps made of MS. Where as it is not possible to drill holes in the trusses members suitable clamps with bolts and nuts shall be used.

For 25 mm diameter conduit width of clip shall be 19mm and of 20 SWG. For conduit of 32 mm and above, width of clip shall be 25mm and of 18 SWG.

Where conduit pipes are to be laid above false ceiling, either conduit pipes shall be clamp to false ceiling frame work or suspended with suitable supports from the ceiling slab. For conduit pipe run along with wall, the conduit pipe shall be clamped to wall above false ceiling in uniform pattern with special clamps if required to be approved by the Engineer-In-Charge at site.

### **3.05 RECESS/CONCEALED CONDUIT.**

The chase in the wall shall be neatly made and of ample dimensions to permit the conduit to be fixed in the manner desired. In the case of building under construction, conduit shall be buried in the wall before plastering and shall be finished neatly after erection of conduit. In case of exposed brick/rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work. Entire work of chasing the wall, fixing the conduit in chases, and burring the conduit in mortar before plastering shall form part of point wiring work.

The conduit pipe shall be fixed by means of staples or by means of saddles not more than 60cm apart or by any other approved means of fixing. Fixing of standard bends and elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe itself with the long radius which shall permit easy drawing in of conductors. Suitable inspection boxes to the barest minimum requirements shall be provided to permit periodical inspection and of facilitate replacement of wires, if necessary. These shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection box covers. Wherever the length of conduit run is more than 10 meters, then circular junction box shall be provided.

### **3.06 OUTLET BOXES & COVERS.**

The switch box shall be made of metal on all sides except on the front. Boxes shall be hot dip galvanised mild steel. Upto 20 x 30 cm size M.S. box shall have wall thickness of 18 SWG and MS boxes above 20 x 30 cm size shall be of 16 SWG. The metallic boxes shall be painted with anticorrosive paint before erection. Clear depth of the box shall not be less than 60mm. All fitting shall be fitted in flush pattern. Phenolic laminated sheet of approved shade shall be used for switch box covers. These shall be of 3 mm thick synthetic phenolic resin bonded laminated sheet as base material and conform to grade P-I of IS: 2036-1994.

### **3.07 ERECTION AND EARTHING OF CONDUITS.**

The conduit if used metallic of each circuit or section shall be completed before conductors are drawn in. The entire system of conduit after erection shall be tested for mechanical and electrical continuity throughout and permanently connected to earth conforming to the requirement by means of special approved type of earthing clamp effectively fastened to conduit pipe in a workmen like manner for a perfect continuity between the earth and conduit. Gas, water pipe shall not be used as earth medium.

### **3.08 SWITCHES.**

All 5 and 15 Amp switches shall be piano type of 240 volts A.C. grade. All switches shall be fixed on 3 mm thick laminated sheet cover. All 5 Amp socket shall be 5 pin type. All 15 Amp socket shall be 6 pin type suitable for 15/5 Amp. All switches, sockets, telephone outlets, etc. shall be in off white finish. The switches controlling the lights or fans shall be connected to the phase wire of the circuit. Switches shall be located at 1200 mm above finished floor level unless otherwise indicated on drawings. In dean ,professor and lecturers rooms switches and socket outlets shall be modular type in modular metal box as per BOQ.

### **3.09 FLUSH COVER PLATE.**

All switches, sockets, telephone outlets etc. shall be fixed on 3 mm thick phenolic laminated sheet cover unless otherwise called for in drawing or BOQ. Flush cover plate shall be secured to the box with counter sunk brass screws & cup washers.

**3.10 WALL SOCKET PLATE.**

All 5 and 15 Amp socket outlet shall be 5 and 6 pin respectively. Each outlet shall have a switch located beside the socket preferably on the same flush cover plate. The earth terminal of the socket shall be connected to the earth wire.

**3.11 WIRING.**

All PVC insulated stranded copper conductor wires shall conform to relevant IS Codes. Cable conductor size and material shall be specified in BOQ.

All internal wiring shall be carried out with PVC insulated FRLS wires of 650/1100 volts grade. The circuit wiring for points shall be carried out in looping in system and no joint shall be allowed in the length of the conductors. Circuit wiring shall be laid in separate conduit originating from distribution board to switch board for light/fan. A light/fan switch board may have more than one circuit but shall have to be of same phase. Looping circuit wiring shall be drawn in same conduit as for point wiring. Each circuit shall have a separate neutral wire. Neutral looping shall be carried out from point to point or in light/fan switch boards. A separate earth wire shall be provided alongwith circuit wiring for each circuit. For point wiring red colour wire shall be used for phase and black colour wire for neutral. Circuit wiring shall be carried out with red, yellow or blue colour PVC insulated wire for RYB phase wire respectively and black colour PVC insulated wire for the neutral wires. Bare copper wire shall be used as earth continuity conductor and shall be drawn alongwith other wires. No wire shall be drawn into any conduit until all work of any nature, that may cause injury to wire is completed. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire.

Before the wires are drawn into the conduit, the conduits shall be thoroughly cleaned of moisture, dust and dirt. Drawing and jointing of copper conductor wires and cables shall be as per CPWD specifications.

Maximum number of PVC insulated 650/1100 V grade aluminium/copper conductor cable conforming to IS : 694 - 1990

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Nominal Cross-Sectional area of conductor in Sq.mm.	25mm		32mm		38mm		51mm		64mm	
	S	B	S	B	S	B	S	B	S	B

1	4	5	6	7	8	9	10	11	12	13
1.5	10	8	18	12	-	-	-	-	-	-
2.5	8	6	12	10	-	-	-	-	-	-
4	6	5	10	8	-	-	-	-	-	-
6	5	4	8	7	-	-	-	-	-	-
10	4	3	6	5	8	6	-	-	-	-
16	2	2	3	3	6	5	10	7	12	8
25	-	-	3	2	5	3	8	6	9	7
35	-	-	-	-	3	2	6	5	8	6
50	5	-	-	-	-	-	-	5	3	6
70	-	-	-	-	-	-	4	3	5	4

**NOTE :**

1. The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.
2. The columns headed 'S' apply to runs of conduits which have distance not exceeding 4.25m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed 'B' apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.
3. Conduit sizes are the nominal external diameters.

**3.12 JOINTS.**

All joints shall be made at main switches, distribution board socket and switch boxes only. No joint shall be made in conduits and junction boxes. Conductors shall be continuous from outlet to outlet.

**3.13 MAINS AND SUBMAINS.**

Mains and sub-main cable where called for shall be of the rated capacity and approved make. Every main and sub-main shall be

drawn into an independent adequate size conduit. Adequate size draw boxes shall be provided at convenient locations to facilitate easy drawings of the sub-main & main cables. Cost of junction box/drawn box is deemed to be included in the rates of sub main wiring. As independent earth wire of proper rating shall be provided for every sub-main. Single phase sub main shall have single earth wire whereas three phase sub main shall be provided with two earth wire. The earth wire of proper rating shall be fixed to conduits by means of suitable M.S. clips at not more than 1000 mm distance.

Where mains and sub-mains cables are connected to the switchgear, sufficient extra lengths of sub main and mains cable shall be provided to facilitate easy connections and maintenance. For termination of cables creeping type cable socket/lugs shall be provided. Same color code as for circuit wiring shall be followed.

### **3.14 LOAD BALANCING**

Balancing of circuits in three phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

### **3.15 COLOUR CODE FOR CIRCUIT & SUBMAIN WIRING.**

Colour code for circuit and submain wiring installation shall be Red, Yellow, Blue for three phases. Black for neutral and yellow/green or green only for earth incase of insulated earth wire.

### **3.16 CLASSIFICATION OF POINTS.**

#### **General**

**Classification and measurement of Point wiring shall be as per CPWD specification for Electrical Works (Part-I-Internal)1994.**

### **3.17 CONDUCTOR SIZE.**

**Wiring shall be carried out with following sizes of PVC insulated stranded single core copper conductor wire/cable.**

- i. Light point. - 1.5Sq.mm
- ii. Ceiling /Cabin/Exhaust Fan Point - 1.5Sq.mm
- iii. Call Bell Point - 1.5Sq.mm
- iv. Plug Point (5 A S.S. outlet) - 1.5Sq.mm
- v. Circuit Wiring - 2.5Sq.mm
- vi. General Power Point - 4Sq.mm

### **4.01 TELEPHONE WIRE/CABLES.**

Separate conduits shall be provided for internal telephone wiring of telephone system commencing from tag block. Each telephone outlet shall be wired with 2 pair telephone cable from the tag block. All telephone wires shall be of .61mm dia annealed tinned high conductivity copper conductor PVC insulated and PVC sheathed grey conforming to ITD specification SWS 113 B & C. Multipair PVC insulated cables laid in conduit shall be provided for connecting various tag blocks. Telephone cables used for external connections shall be armoured. These cable shall be laid directly in ground or in pipe etc. as call for else where. Internal Telephone wiring in conduits shall be carried out in atleast 25 mm dia conduit.

## **5.00 LIGHTING FIXTURE AND FANS**

### **5.01 GENERAL**

- a. The Contractor shall supply and install lighting fixtures including but not limited to lamps, ballasts, accessories fixing hardware necessary for installations, as shown on the Drawings, as required, and as herein specified.
- b. All fixtures shall be delivered to the building complete with suspension accessories, canopies, hanging devices, sockets, holders, reflectors, ballasts, diffusing material, louvers, plaster frames, recessing boxes, etc. all wired and assembled as indicated.
- c. Full size shop detail drawings of special fixture or lighting equipment, where called for in the fixtures schedule, shall be submitted to the Engineer in-charge for approval.
- d. Fixtures, housing, frame or canopy, shall provide a suitable cover for fixture outlet box or fixture opening.
- e. Fixtures shall comply with all applicable requirements as herein outlined unless otherwise specified or shown on the Drawings.
- f. Manufacturer's name and catalogue number of lighting fixtures are given for general reference only. It shall be understood that the actual fixtures supplied shall meet all the requirements of the specification, and, if necessary, the standard fixture indicated for reference, shall be modified accordingly.
- g. Fixtures shall bear manufacturer's name and the factory inspection label.
- h. Fixtures shall be completely wired and constructed to comply with the IEE wiring regulations requirements for lighting fixtures, unless otherwise specified.
- i. Revamping the fixture shall be possible without having to remove the fixture from its place.

j. Lamps of the proper type, wattage and voltage rating shall be furnished and installed in each fixtures.

## **5.02 WIRING WITHIN THE FIXTURES**

- a. Fluorescent fixtures shall be wired with not smaller than 1.5 sq. mm asbestos-covered wire. No splice or tap shall be located within an arm, stem or chain. Wire shall be continuous from splice in outlet box of the building wiring system to lamp socket or to ballast terminals.
- b. Wiring within incandescent fixtures and for connection to the branch circuit wiring up to the outlet box of lighting point shall not be less than 1.5 sq. mm silicone rubber insulated wire.(150oC temperature).

## **5.03 INSTALLATION**

Fixtures shall be installed at mounting heights as detailed on the Drawings or as instructed on site by the Engineer-In-charge.

Pendent fixtures within the same room or area, shall be installed plumb and at a uniform height from the finished floor. Adjustment of height shall be made during installation.

Flush mounted recessed fixtures, shall be installed so as to completely eliminate leakage of light within the fixture and between the fixture and adjacent finish.

Fixtures mounted outlet boxes shall be rigidly secured to a fixture stud in the outlet box. Hickeys or extension pieces shall be installed where required to facilitate proper installation.

## **5.04 LAMPS-GENERAL**

Lamp shall be supplied and installed in all lighting fixtures listed in the Schedules of Lighting Fixtures on the drawings.

Lamps used for temporary lighting service shall not be used in the final fixture units.

Lamps shall be of wattage and type as shown in the Schedule of Lighting Fixtures.

Lamps for permanent installation shall not be placed in the fixtures, until so directed by the Engineer In-charge and this shall be accomplished directly before the building areas are ready for occupancy by the Client.

### **5.05 LAMPS-FLUORESCENT**

Lamps shall be of hot electrodes, preheated, normal start type.

Lamps shall have bi-pin bases and a minimum approximate rated life of 8,000 hours.

Unless otherwise indicated on the Drawings, Lamps shall have the colour rendering features and lumens/watt output of lamps with WHITE colour designation as manufactured by reputed indigenous manufacturers.

### **5.05 LAMPS- COMPACT FLUORSECENT**

### **5.07 LAMPS-INCANDESCENT**

Incandescent lamps shall be inside frosted type. Lamps shall have a minimum approximate rated life of 750 hours.

Lamps shall be manufactured by reputed indigenous manufacturers.

### **5.08 BALLASTS-FLUORESCENT**

Only single and/or two-lamp ballast shall be used in any one fixture. Ballast shall conform to IS 1534(Part I)-1977

Ballasts shall be high power factor type.

Ballasts shall have manufacturer's lowest sound level and case temperature rise rating.

Ballasts shall be special cool operated type.

Ballasts for indoor fixtures shall be protected by an integral thermal automatic resetting protective unit which shall disconnect the ballast in the event of overheating.

Ballasts shall be of the same manufacture as the lamps.

### **5.09 BALLAST – COMPACT FLUORESCENT**

### **5.10 FIXTURE SAMPLES**

Detailed catalogue for all fixtures or if so required by the Engineer In-charge sample fixtures shall be submitted for prior approval of the Engineer In-charge before orders for the fixtures are placed.

### **5.11 TESTING**

After all lighting fixtures are installed and are connected their respective switches, test all fixtures to ensure operation on their correct switch in the presence of the engineer.

All un operating fixtures or ones connected to the wrong or inconveniently located switch shall be correctly connected as directed by the Engineer In-charge.

#### **5.10 CEILING FANS**

All ceiling fans shall be provided with suspension arrangement in the concrete/slab/roof members. Contractor to ensure that provision are kept at appropriate stage at locations shown on the drawing. Fan box with MS hook shall be as per CPWD specification. Ceiling fan shall be double ball bearing type, copper wound motor complete with canopy, down rod, blades etc. and shall conform to relevant IS standards ceiling fan shall be white in color. Ceiling fan shall be provided with standard regulator. Regulator shall be suitable for 240 volts A.C supply 50 Hz and shall be of continuous duty type

#### **5.11 EXHAUST FANS**

Exhaust fans shall be heavy duty type with double ball bearing and conforming to IS 2312-1967. Exhaust fan shall be complete with copper wound motor, capacitor, Louver/shutter, frame and mounting bracket. Exhaust fan shall be suitable fan operation on 240 volts single phase A.C supply.

### **6.0 EARTHING/GROUNDING**

#### **6.01 Earthing**

All the non-current carrying metal parts of electrical installation shall be earthed properly. All metal conduits trunking, cable armour, switchgear, distribution fuse boards, lighting fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. All earthing will be in conformity with the relevant Indian Electricity Rules 1956 and Indian Standard Specifications IS:3043-1966.

#### **6.02 EARTHING CONDUCTOR**

Earth continuity conductor alongwith submain wiring from Main/Sub Distribution boards to various distribution boards shall be of copper. Earth continuity conductor from distribution board onward upto outlet point shall also be of bare copper. Earth continuity conductor connecting Main & Sub Distribution boards to earth electrode shall be with galvanised MS strip.

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#### **6.04 Connection of Earthing conductors**

Main earthing conductor shall be taken from the earth connections at the main distribution panel to the earth electrode with which the connection is to be made. Distribution boards, earthing conductor shall run from Main Distribution Boards.

Circuit earthing conductor shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, or its distribution boards. Cable sheathing and armouring shall be earthed at the ends adjacent to switch boards at which they originate, or otherwise at the commandment of the run by an earthing conductor in effective electrical contact with cable sheathing. Where equipment is connected by flexible cord, all exposed metal parts of equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductor within the flexible cord. Switches, accessories, lighting fittings etc. which are rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered as a part of earthing conductor for earthing purposes, even though the run of metallic conduit is earthed.

## **7.00 Earthing Stations**

### **7.01 PLATE EARTH ELECTRODE**

Earthing shall be provided with either GI plate electrode or copper plate electrode of following minimum dimensions.

- i. GI Plate Electrode : 600mm x 600mm x 6mm thick
- ii. Copper Plate Electrode : 600mm x 600mm x 3mm thick

The electrode shall be buried in ground with its faces vertical and not less than 3 metres below ground level. 20mm dia medium class GI pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top of this pipe for watering and earth electrode. Earth electrode the watering funnel attachment shall be housed in masonry enclosure of not less than 300 x 300 x 300mm deep. A cast iron or MS frame with cover having locking arrangement shall be provided at top of metres from the building. Care shall be taken that the excavation for earth electrode may not affect the column footing or foundation of the building. In such cases electrode may be further away from the building.

## **7.02 Earth Connections**

All metal clad switches and other equipment carrying single phase circuit, shall be connected to earth by a single connection. All metal clad switches carrying 3 phase shall be connected with earth by two separate and distinct connections. The earthing conductor inside the building wherever exposed shall be properly protected from mechanical injury by running the same in GI pipe of adequate size. The earthing conductor shall be painted to protect it against corrosion. The over

lapping in G.I./Copper strips in joints where required shall be minimum 75 mm. The joints shall be riveted with G.I./Copper rivets and brazed in approved manner. Lugs of adequate capacity and size shall be used for all termination of conductor wires above 5 Sq. mm size. Lugs shall be bolted to the equipment body to be earthed after the metal is cleaned of paint and other oily substance.

### **7.0.3 Artificial Treatment of Soil**

If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium carbonate, Copper sulphate, salt and soft coke or charcoal in suitable proportions.

### **7.04 Resistance to Earth**

The resistance to each earthing system shall not exceed 1.0 Ohm.

## **8.00 TESTING**

### **8.01 GENERAL**

At the completion of the work, the entire installation shall be subjected to the following tests:

- a) Polarity Test
- b) Insulation Resistance Test
- c) Earth Continuity Test
- d) Earth resistivity Test

Besides the above tests any other test specified by the local authority shall also be carried out.

All tested and calibrated instruments for testing, labour and materials and incidentals necessary to conduct the tests shall be provided by the contractor at his own cost.

### **8.02 TESTING OF WIRING**

All the wiring system shall be tested for continuity of circuits, short circuits and earthing after the wiring is completed and before energising.

### **8.03 INSULATION RESISTANCE TEST**

The insulation resistance shall be measured by applying between earth and the whole system of conductors, or any section thereof, with all fuses in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure provided that it does not exceed 600 volts for medium voltage circuits. Where the supply is derived from AC three phase system the neutral pole of which is connected to earth, either direct or through added resistance

measured as above shall not be less than 50 divided by the number of points on the circuit provided that the whole Installation shall not be required to have an insulation greater than one megohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and all the conductors connected to the middle wire of the neutral or to the other phase conductors of the supply. Such a test shall be carried out after removing all metallic connections between the two poles of the installation and in those circumstances the insulation resistance between the case of frame work of housing and power appliances, and all live parts of each appliance shall not be less than that specified in the relevant Indian Standard Specifications or where there is no such specification shall not be less than half a megohm.

#### **8.04 TESTING OF EARTH CONTINUITY TEST**

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

Testing of Polarity of Non linked single pole switches: In a two wire installation a test shall be made to verify that all non-linked single pole switches have been fitted in the same conductor throughout and such conductor shall be labeled or marked for connections, to an outer or phase conductor or to the non-earthed conductor of the supply. In the three or four wire installation a test shall be made to verify that every non-linked single pole switch fitted in a conductor to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of Architect/Consultant as well as the Local authorities.

#### **8.05 EARTH RESISTIVITY TEST**

Earth Resistivity Test shall be carried out in accordance with Indian Standard Code of Practice for earthing IS 3043-1966. All tests shall be carried out in the presence of the Architect/Consultant.

#### **9.020 LIGHTING DISTRIBUTION BOARDS**

**9.01** The Distribution Panel and Distribution boards shall be suitable for operation on 3 phase/single phase 415/230 Volts, 50 cycles, neutral grounded at transformer and short circuit level not less than 31 MVA at 415 Volts.

The Distribution Panel/Boards shall comply with the latest addition of relevant Indian Standards and Indian Electricity Rules and Regulations.

## **9.02 CONSTRUCTION FEATURES**

The Distribution Panels/Boards shall be metal enclosed sheet steel cubical, indoor, dead front, floor mounting/wall mounting type. The Distribution board shall be totally enclosed completely dust and vermin proof. Gaskets between all adjacent units and beneath all covers shall be used to render the joints dust proof. Distribution Boards shall be preferably arranged in multitier. All MS sheet steel used in the construction of Distribution Boards shall be 2 mm thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.

All the panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned.

Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with bank nuts. Self threading screws shall not be used in the construction of Distribution boards. A base channel of 75 mm x 75 mm x 9mm thick shall be provided at the bottom.

Knockout holes of appropriate size and number shall be provided in the distribution board in conformity with the location of incoming and outgoing.

Removable sheet steel plates shall be provided at top and bottom to drill holes for cables entry at site if required.

## **9.03 BUS BAR CONNECTIONS**

The bus bars and interconnections shall be electrolytic copper and of rectangular cross sections suitable for full load current for phase bus bars and half rated current for neutral bus bar and shall be extensible on either side. The bus bars and interconnection shall be insulated with insulation tapes and color coded. The bus bars shall be supported on unbreakable non-hygroscopic insulated supports at regular intervals to withstand the forces arising from short circuit in the system. All bus bars shall be provided in a separate chamber and properly ventilated. All bus bar connections shall be done by clamping. No holes shall be drilled in the bus bars for mounting clamps.

All connections between bus bars and switches and between switches and cable alley terminal shall be through solid copper strips of proper size to carry full rated current and insulated with insulating tapes.

## **9.04 FIXING OF MCB'S**

All TPN Distribution Boards shall be provided with SP MCB's as outgoing. Separate neutral bus bars shall be provided for TPN distribution boards for each phase.

MCB's shall be provided on the phase of each circuit. The individual banks of MCB's shall be detachable. There shall be ample space

behind the banks of MCB's to accommodate all the wiring. All the internal wiring of distribution boards shall be concealed behind 5 mm thick Bakelite sheet. All the distribution boards shall be completely factory wired, ready for connections. All the terminals shall have adequate current rating and size to suit individual feeder requirements. Each circuit shall be clearly numbered from left to right to correspond with wiring diagram. All the switches and circuits shall be distinctly marked with a small description of the service installed.

#### **9.05 CABLE COMPARTMENTS**

Cable Compartments of adequate size shall be provided in the distribution panel/boards for easy termination of all incoming and outgoing cables entering from bottom. Adequate supports shall be provided in cable compartments to support cables. All incoming and outgoing switches, terminals shall be brought out to terminal blocks in cable compartments.

#### **9.06 CIRCUIT COMPARTMENTS**

Each Circuit breaker and switch fuse units shall be housed in separate compartments and shall be enclosed on all sides. Sheet steel hinged lockable doors shall be duly interlocked with the breaker/switch fuse unit in 'ON' and 'OFF' position. Safety interlocks shall be provided for air circuit breaker to prevent the breaker from being drawn out when the breaker is in 'ON' position. The door shall not form an integral part of the draw out portion of the ACB. All instruments and indicating lamps shall not be mounted on the ACB compartment door. Sheet steel barriers shall be provided between the tiers in a vertical section.

#### **9.07 INSTRUMENT ACCOMMODATION**

Separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contractors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of circuit breaker, bus bars and contact.

#### **9.08 TERMINALS**

The outgoing terminals of the breaker and neutral link shall be brought out to a terminal block suitably located at the rear side of the panel. Separate cable compartments shall be provided for incoming and outgoing cables.

#### **9.09 WIRE WAYS**

A horizontal wire way with screwed covers shall be provided at the top to take interconnecting control wiring between different vertical section.

#### **9.10 SWITCH FUSE UNITS**

The switch fuse units shall be 3 pole double break type (AC-23A) suitable for load duty quick make and break action. Separate neutral link shall be provided in the switch. All switch fuse units shall be provided with hinged doors duly interlocked with operating mechanism, so as to prevent opening of the door when the switch is in 'On' position and also to prevent closing of the switch when the door is not properly secured. All contacts shall be silver plated and all live parts shall be shrouded. High rupturing capacity (HRC) fuse links shall be provided with switch fuse units and shall be in accordance with IS: 2208 - 1962 and having rupturing capacity of not less than 31 MVA at 415 volts. HRC fuse links shall be provided with visible indicators to show that they have operated.

### **9.11 FUSES**

Fuses shall be high rupturing capacity (HRC) fuse links and shall be in accordance with IS:2208-1962 and having rupturing capacity of not less than 31 MVA at 415 Volts.

### **9.12 PAINTING**

All sheet steel shall undergo a process of degreasing, picking in acid, cold rinsing, Phosphating, pasivating and then sprayed with a high corrosive resistant primer. The primer shall be baked in an oven. The finishing treatment shall be with powder coating..

### **9.13 LABELS**

Engraved PVC labels shall be provided on all incoming and outgoing feeder switches. Circuit diagram showing the arrangement of the circuit inside the distribution board shall be pasted on inside of the panel door and covered with transparent laminated plastic sheet. All the distribution boards shall be subject to tests specified in relevant Indian Standards and test certificates shall be furnished.

### **9.14 METERS**

All the meters shall be housed in a separate compartment and accessible from front only. Lockable doors shall be provided for the metering compartments. The distribution boards shall be provided with indicating panel comprising of 1 No.(0-500V) 90 cm x 90 mm square type voltmeter with 3 way "OFF" selector switch and CT operated ammeter with 3 way and neutral selector switch of appropriate range and scale. Wiring for motors shall be colour coded and labeled with approved plastic beads for identification.

## **10.0 Point Wiring (Internal & External Telephones)**

- (a) The point wiring shall be carried out with Double pair telephone wire/cable, unarmoured, PVC insulated and sheath. 0.61 mm dia annealed tinned copper conductor (IS: 2532-1965) in suitable size conduit (one pair always remaining spare for one point)

Minimum Dia of Conduit for Internal/External Telephone Wiring - 20mm.

If more than one telephone point has to be provided at one point, multicore, unarmoured telephone cable shall be used (pairs required are equal to 2 No.of points)in suitable size of conduit.

- (b) The point shall commence from the main telephone tag box/sub tag box and would terminate at outlet box of point. Connection at both ends included in point wiring.
- (c) Fixing of conduit, conduit accessories draw out boxes and outlet box etc. in concealed/surface conduit works) shall be applicable for telephone wiring conduit system also.
- (d) Each telephone point shall have 1 No. flush type 2 pin. telephone socket outlet fixed on 3 mm thick, hylum sheet in M.S. outlet box.
- (e) Joint in telephone wiring (between main tag box/sub tag box and outlet box of point) shall not be allowed and the contractor should bear the wastages of wire if resulted due to this special requirement of telephone system.
- (f) External/Internal telephone and intercom wiring can be drawn in the same conduit, provided after drawing wires, 50% of conduit cross sectional area is free. However, independent PVC insulated telephone wire of suitable pairs shall be used for external, internal and intercom.
- (g) To identify each pair of multipair telephone wire/cable, PVC indication numbers shall be put on both end of pair just before termination.

### **10.1 Telephone Tag Boxes**

These shall be of MS sheet 2 mm thick with connector suitable for telephone connection (as approved by ITI). It shall have hinged MS sheet cover.

## **11.00 L.T. CABLES AND CONTROL CABLES**

### **11.01 General**

MV cables shall be supplied, inspected laid tested and commissioned in accordance with drawings, specifications, relevant Indian Standards Specifications and cable manufacturer`s instructions, The cable shall be delivered at site in original drums with manufacturers name clearly written on the drum.

The recommendation of the cable manufacturer with regard to joining and sealing shall be strictly followed.

### **11.02 Material**

The MV cable shall be PVC insulated. Aluminium conductor armoured cable conforming to IS : 1554 - 1988 ( Part - I) laid in trenches/ducts as shown on drawings.

**11.03** All cables shall be inspected upon receipt at site and checked for any damage during transit.

#### **11.04 Joints in Cables**

The Contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoidance of joining cables. This apportioning shall be got approved by the architect before the cables are cut to lengths. straight joints are prohibited.

#### **11.05 Laying cables**

Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cables. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks, the drums shall be unrolled and cables run over wooden rollers in trenches at intervals not exceeding 2 meters. Cables shall be laid at depth of 0.7 meters below ground level. A cushion of sand, not less than 80 mm shall be provided both above and below the cable and joint boxes and other accessories. Cable shall not be laid in the same trench or along side a water main. The cable shall first be laid in excavated trench 80 mm layer of sand and shall be spread over the cable. The cable then shall be lifted and placed over the sand bed. the second layer of 80 mm sand shall then be sprayed over the cable. The relative position of the cables, laid in the same trench shall be preserved and the cables shall not cross each other as far as possible. at all changes in directions in horizontal and vertical planes, the cable shall be bent smooth with a radius of bend not less than 8 times the diameter of cable, Minimum 3 meters long loop shall be provided at both sides of every; straight joint and 3 meters at each end of cable. Distinguishing marks shall be made on the cable ends for identification. Insulation tapes of appropriate voltage and in red, yellow and blue colour shall be wrapped just below the sockets for phase identification.

#### **11.06 Protection of Cables**

The cables shall be protected by bricks on the top layer of the sand for the full length of underground cable. Where more than one cable is running in the same trench, the bricks shall cover all the cables and shall project a minimum of approximately 80mm on either side of the cables. Cables under road crossings and any other places subject to heavy traffic, shall be protected by running them through Hume Pipes of suitable size. The depth of the Hume Pipe shall be 1 meter below the finished floor level.

#### **11.07 Excavation & Back fill**

All excavation and back fill including timbering, shoring and pumping required for the installation of the cables shall be carried out by the Contractor in accordance with the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Back fill for trenches shall be filled in layer not exceed 150-mm. Each layer shall be properly rammed and consolidated before laying the next layer. The contractor shall restore all surface, road ways, side walks, curbs, walls of other works cut by excavation to their original condition, satisfactory to the owner`s representative.

### 11.08 Testing of cables

Prior of burying of cables, following tests shall be carried out :

Insulation test between phases and phase and earth for each length of cable before and after jointing.

On completion of cable laying work, the following test shall be conducted in the presence of owner`s representative.

- a) **Insulation Resistance Test. (Sectional and overall)**
- b) Continuity Resistance Test.
- c) Sheathing continuity Test.
- d) Earth Test.

All tests shall be carried out in accordance with relevant Indian Standard Code of Practice and Indian Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above test and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Architect/Consultant.

### 12.0 UNINTERRUPTED POWER SUPPLY

1) POWER		<b>3 KVA</b>
<b>8KVA</b>		
2) TECHNOLOGY	Double conversion	Double
conversion		
	True sine wave	True sine
wave		
INPUT		
3) RATED	220 V	220
VOLTAGE		

			31
4)	VOLTAGE 290	170-290	170-
	RANGE		
5)	RATED	50 HZ	50 HZ
	FREQUANCY		
	OUT PUT		
6)	RATED	220V	220V
	VOLTAGE		
7)	FREQUANCY HZ	50 HZ	50
8)	REGULATION	1.05	1.05
9)	VOLTAGE WITH100% LOAD	<+/- 1% WITH100% LOAD	<+/- 1%
	REGULATION		
10)	BACK UP TIME	15 MIN.	10 MIN.

### **13.00 COMMISSIONING CHECK LIST OF ELECTRICAL WORKS.**

#### **13.01 SCOPE**

Before commissioning of electrical, installations the contractor shall check all the items mentioned and arrange for testing of each equipments in presence of Engineer-in-charge.

#### **14.00 FUNCTIONAL CHECKING**

- a) All 415 and 230 V power cables to be meggered.

- b) Check continuity of grid conductors and wires.
- c) Soil resistivity tests.

In addition to the above, any other tests specified by manufactures shall be carried out as per manufacturer`s instructions.

**ANNEXURE : SCHEDULE OF QUANTITIES OF  
GENERAL ELECTRICAL SYSTEM**

S. No.	Description	Qty	Unit	Rate	Amount
	Supply Installation, testing and commissioning of luminaires socket boxes, fans, wiring and control equipment as per following details				
<b>1</b>	<b>Luminaires</b>				
1.1	Recessed lighting fixture white in colour suitable for 120 w Par-38 lamp, locking type porcelain holder housed in epoxy powder coated enclosure duly wired COMPLETE WITH LAMP. Make : PLAINTON OR EQUIVALENT	15	Each		
1.2	Recessed mounting luminaire compact fluorescent down light suitable for 2 x 26w (PL-C) compact fluorescent lamps with chrome plated reflector glass diffuser complete with Electromagnetic ballast/ reflector/louvers/housing/lamp and attachments & complete in all respect , suitable for the following. Make : PIERLITE / PHILIPS / PLAINTON	50	Each		
1.3	Recessed mounting luminaire compact fluorescent down light suitable for 1 x 18w (PL-C) compact fluorescent lamps with chrome plated reflector glass diffuser complete with Electromagnetic ballast/ reflector/louvers/housing/lamp and attachments & complete in all respect , suitable for the following. Make : PIERLITE / PHILIPS / PLAINTON	30	Each		
1.4	500W Halogen lights Make : PIERLITE / PHILIPS OR EQUIVALENT	2	each		
1.5 a	Providing and fixing surface mounting mirror optics fluorescent luminaire, made of CRCA MS sheet epoxy powder coated and pre wired with electronic ballast, rotor holder main connector etc. complete, suitable for following with highly pure aluminium reflector for optical performance and serrated aluminium cross louvers. The mirror assembly to be removable for re lamping from below. <b>(a) 2 x 28 W T5 Fluorescent lamp</b>	4	each		

	Make : PIERLITE / PHILIPS OR EQUIVALENT				
<b>1.5b</b>	Providing and fixing Wall mounting mirror optics Compact fluorescent luminaire, made of High Grade Engineering Plastic and pre wired with electronic ballast, rotor holder main connector etc. complete, suitable for following with pre- anodized optically designed mirror for optical performance .Mirror assembly and lamellae to be integrated with the housing. lamellae. The mirror assembly to be removable for re lamping from below.  <b>2x PL-S 11w Philips / Pierlite or equivalent</b>	4	nos		
<b>1.5 (c)</b>	Surface mounting mirror optics Compact fluorescent luminaire, made of High Grade Engineering Plastic and pre wired with electronic ballast, rotor holder main connector etc. complete, suitable for following with pre- anodized optically designed mirror for optical performance .Mirror assembly and lamellae to be integrated with the housing. lamellae. The mirror assembly to be removable for re lamping from below. Make 2x PL-S 18w Make Pierlite/ Phillips or equivalent	15	Each		
<b>1.6 a</b>	Aluminium extruded powder coated black LED Dual Step Lights i.e to light the riser & step edge of 1.0 mtr each Make Plainton or equivalent	70	nos		
<b>1.6 b</b>	Driver for the LED lights as above Make Plainton or equivalent	3	Nos		
<b>1.7</b>	Aluminium cast powder coated black chair light with row & seat numbers. Make Plainton or equivalent	90	nos		
<b>1.7b</b>	Driver for the chair lights as above Make Plainton or equivalent	2	nos		
<b>1.8</b>	High speed 1200 mm sweep ceiling fans ( Cropmpton / Orient / Havells)	2	nos		
<b>2</b>	<b>WIRING SYSTEM</b>				
<b>2.1 a</b>	<b>LOOPED LIGHT POINT WIRING</b> Light points more than 5 and less than 9 in number looped together with PVC insulated 2x2.5 sqmm multi strand copper conductor PVC insulated and 1x1.5 sqmm solid copper conductor				

	PVC insulated 1100V FRLS ISI marked in recessed/surface PVC conduit System Of 2mm wall thickness Of approved make including making of chase (recessed in wall) incase of recessed conduit and fixing of saddles/clamps in case Of surface conduit or on cable tray including cost of wires/conduit and accessories/saddles clamps etc With circuit termination at Control Room	35	Each		
	<b>POWER POINT</b>				
2.2	16A Power point with 2x2.5 sq mm multi strand & 1x2.5 sqmm solid copper conductor PVC insulated and PVC sheathed wires 1100V FRLS ISI marked in surface / recessed PVC conduit of 2mm thickness complete with Switch/socket/box /sheet/cover plate complete in all respect including cost of wire / conduit accessories holders/boxes/switch/sheet/cover plates/connectors etc. as per site requirement, complete in all respect including making connection with lugs duly crimped.	12	Each		
2.3	Light point / two way point with 2x2.5 mm <sup>2</sup> multi strand copper conductor & 1x1.5 sqmm PVC insulated and PVC sheathed wires 1100VFRLS ISI marked in surface/ recessed PVC conduit of 2mm thickness complete with Switch/holder/box /sheet/cover plate complete in all respect including cost of wire/conduit/conduit accessories holders/boxes/switch/sheet/cover plates/connectors etc. as per site requirement, complete in all respect including making connection with lugs duly crimped.	7	each		
3.0	3 step 2.5KW dimmer for Par 30 Lights Make : Lutron / Effectron or equivalent	1	each		
	<b>SIGNAGE</b>				
4.0	Door top surface mountable EXIT signage with 2 hr battery backup & SLA rechargeable battery. Make PLAINTON or Equivalent	8	nos		

5.0	<p>Flush /recessed mounted Distribution board made out of 1.2 mm thick sheet steel pre treated and powder coated with solid steel lockable hinged door, IP42 degree protection. Each phase to have separate neutral bus bar complete with necessary busbars and the neutral busbar of the following ratings</p> <p>TPN 12 way with 0-32 amp MCB &amp; 63 Amp 4 pole MCB</p>	4	Each		
<b><u>TOTAL</u></b>					