



## ESTATE SECTION

### PERCENTAGE RATE TENDER PAPER



### ENQUIRY TENDER: 1

- Name of work** : Streetlight work at Basketball ground, Activity center and other places at SVNIT, Surat.
- Name of Contractor** :
- Receipt of enquiry tender** : ~~13/06/2018~~ Now extended to **16/07/2018** up to **5:00 P.M.**

---

The Director, S. V. National Institute of Technology, Ichchhanath, Surat – 395 007.  
☎ 0261- 2201631, 2201611

**Name of work** : Streetlight work at Basketball ground, Activity center and other places at SVNIT, Surat.

## **I N D E X**

This enquiry tender documents contains 71 pages.

<b>CONTAINS</b>	<b>PAGE NO.</b>
A. Tender Notice	3
B. Tender Copy	4
C. Schedule – B	5 – 7
D. Memorandum of Works	8 – 10
E. Checklist of documents to accompany the tender	11
F. Important Terms and Conditions	12
G. Specification booklet for Electrical works	13 – 70
H. Declaration Form	71

ISSUED TO:      M/S \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dean,  
Planning & Development**



**SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY,  
ICHCHHANATH, SURAT- 395 007  
Ph. 91- 0261- 2259571, 2259582-84**

### **ENQUIRY TENDER NOTICE**

The Director, Sardar Vallabhbhai National Institute of Technology, Surat invites sealed Enquiry Tender from Contractors registered in various categories engaged in Public Work Department (PWD), Municipal Corporation, Semi-Government Organization and Public Sectors for the following:

<b>Sr. No.</b>	<b>Name of Work</b>	<b>Estimated Cost (in Rupees)</b>	<b>Time limit</b>
1.	Streetlight work at Basketball ground, Activity center and other places at SVNIT, Surat.	4,22,930.00	3 Months

1. The enquiry tender form must be submitted on or before office hours during **23/05/2018 to 13/06/2018 Now Extended to 16/07/2018** in the office of Institute through post or in person with the copy of the registration, solvency & specified as above. The Institute is not responsible for loss or postal delay of enquiry tender forms. The enquiry tenders may be opened on ~~15/06/2018~~ **18/07/2018** at 4:00 p.m. in Estate & Store Building. For the above work, the necessary blank enquiry tender copy must be obtained from the Institute website <http://www.svnit.ac.in>
2. All rights are reserved by the Director to reject any enquiry tenders or all without specifying the reasons.

**DIRECTOR**

**SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY,**

**SURAT-395 007.**

**B. ENQUIRY TENDER COPY**

1. Name of the Work : Streetlight work at Basketball ground, Activity center and other places at SVNIT, Surat.
2. Estimated Cost : Rs. 4,22,930.00
3. Last Date of Receipt of Sealed Tender : ~~13/06/2018~~ 16/07/2018 up to 5:00 p.m. in Administrative Building
4. Date of Opening of the Tender : ~~15/06/2018~~ 18/07/2018 at 4:00 p.m. in the Estate & Store Building.
5. Security Deposit : 10% i.e. Rs. 42,293.00 on Tender Amount.  
5% of the S.D. i.e. Rs. 21,147.00 by cash or Demand Draft only.  
Remaining 5% shall be deducted from the Running bills.
6. Time Limit : 3 Months
7. An agreement shall be executed on Sixty Rupees stamp paper as per prevailing rules and regulations at the cost of the contractor after giving work order for starting the work.
8. S.D. shall be paid in "Account Section" on working days between 10.00 a.m. to 3.00 p.m. hours which may please be noted.

**Name of work** : Streetlight work at Basketball ground, Activity center and other places at SVNIT, Surat.

**SCHEDULE – B**  
**(As per SOR 2012-13)**

Sr. No.	Qty.	Item Description	Rate		Unit	Amount	
			Rs.	Ps.		Rs.	Ps.
1		Supplying <b>Steel tubular pole (Swaged)</b> conforming to IS - 2713 (Part-II) 1980. The manufacturing process of steel tubular pole should be as per IS specification. Basic steel tube should be ISI Marked. Pole should be painted by one coat of Zinc Comet Primer and two coat of Aluminum /approved paint to be erected on/in existing Foundation. The length of poles is as below.					
		<b>(A) 7.5 mtr. Long Swaged Steel tubular pole</b>					
	5.00	<b>(i) Pole</b> as per IS code <b>410-SP-4</b> with 300 X 300 X 4 mm base plate. (Approximate Pole weight 67 Kg) For burial erection	7,400.00		Ea.	37,000.00	
		SOR No. 6-1-3(A)					
		<b>(D) 10.00 mtr. Long Swaged Steel tubular pole</b>					
	4.00	<b>(i) Pole</b> as per IS code <b>410-SP-40</b> with 300 X 300 X 6 mm base plate.(Approximate weight 128 Kg) For burial erection	13,900.00		Ea.	55,600.00	
		SOR No. 6-1-3(D)					
2		Providing street light pole bracket consisting of Light Class MS. Pipe of 4.2 cms. Outside dia. Complete with suitable M.S. sleeve tubing of approximate 45 cms. and length suitable for 76.5 mm/80 mm./require size pole top having sufficient fasteners for fixing the brackets and having a spread of 1 mtr. Length with suitable rise as per site condition & suitably welded stiffener reducer and nipple with check nut complete painted with one coat of Red oxide / PU base primer and two coats of Aluminium / PU paint. Paint with following nos. of arms.					
	10.00	<b>[A] Single Arm bracket 1 mtr.</b>	600.00		Ea.	6,000.00	
		SOR No. 6-5-3(A)					
3		Supplying & erecting approved make SMC press moulded composite FRP. loop-in, loop-out approx. 2mm thick box complete with bakelite connector strip 4way & hinged doors having locking arrangements with mounting clamp with nuts, bolts & washers suitable for erection on pole with cable clamps& earth bolt of following the size of the box.					
	12.00	<b>(a) 300mm x 200mm x 100mm [deep]</b>	960.00		Ea.	11,520.00	
		SOR No. 6-4-3(A)					

4		"B" class Galvanized iron pipe having a smooth finished bore of the pipe on both ends erected nuts and bolts along the pole/wall shaping the pipe as per site requirement. Pipe dia as following.			
	32.00	(c ) 40 mm dia. SOR No. 6-5-5(C)	290.00	Mtr.	9,280.00
5	15.00	Providing M-20 / 1:2:4 cement concrete foundation & 70 % PCC from bottom including excavation for the pole of size 60 x 60 x 120 cms. Deep in below ground level with plinth of 45 cms x 45 cms (or 45 cms dia x 45 cms) high upper ground level with necessary curing and finishing in an approved manner. (for 7.5 & 8/8.5 mtr pole)	1,300.00	Ea.	19,500.00
		<b>Note: Out of 15 foundations, 5 are for new poles and 10 for existing poles whose foundation are damage. Dismantling old foundation and making a new foundation at the same place along with all kind of handling of poles is in contractor scope.</b>			
		SOR No. 6-3-5			
	6.00	Providing M-20 / 1:2:4 cement concrete foundation & 70 % PCC from bottom including excavation for the pole of size 60 x 60 x 150 cms. Deep in below ground level with plinth of 45 cms x 45 cms(or 45 cms dia x 45 cms) high upper ground level with necessary curing and finishing in an approved manner. (For 9 & 10 mtr pole).	1,650.00	Ea.	9,900.00
		<b>Note: Out of 06 nos. of foundation, 04 are for new poles and 02 for existing poles whose foundation are damage. Dismantling old foundation and making new foundation at the same place along with all kind of handling of poles is in contractor scope.</b>			
		SOR No. 6-3-6			
6	60.00	Providing , erecting , fabricating the M.S. structure as per requirement on site incorporating proper size of M.S. angles, flats, bars, channels, sections complete with cutting, welding, grinding & finishing duly painted with one coat of red oxide with erection on site as per direction of engineer in charge with necessary grouting, cementing, plastering & finishing complete.	90.00	Kg.	5,400.00
		SOR No. 3-16-4(A)			
7		Providing and erecting, heavy duty flood light integral luminaire comprises die cast aluminum body with heat resistant toughened front glass, silicon rubber gasket, anodized reflector hot deep powder coated cradle clamp with a suitable size of necessary built-in control gear complete with lamp.			

		(c) With one no. 250-watt HPSV / Metal halide lamp			
	30.00	Cat.III	5,500.00	Ea.	165,000.00
		Make: Philips/Crompton/Bajaj			
		SOR No. 2-11-1(C)			
8		Supplying and erecting <b>Flexible PVC</b> insulated multistrand multicore 1.1 kV grade ISI marked <b>copper wires</b> of the following size to be erected as directed.			
	360.00	h) 2.50 Sq.mm 3 core round PVC sheathed	75.00	Mtr.	27,000.00
		SOR No. 1-4-5(H)			
		Make: Finolex / Havells / RR / L&T			
9		Providing and erecting XLPE (IS:7098) (I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on the wall with necessary clamps or in existing trench/pipe of following the size of cables			
	100.00	(e) 4 core 25 Sq. mm	240.00	Mtr.	24,000.00
		SOR No. 4-3-4(E)			
		Make: CCI / Gloster / Polycab / Havells			
10		Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete without going tails, insulating tape etc. for following the size of cables.			
	16.00	(A) 3 & 1/2 / 4 core 25 Sq. mm	70.00	Ea.	1,120.00
		SOR No. 4-6-3(A)			
11		Solderless crimping type Aluminium lugs conforming to IS suitable for cable of the following size evenly crimped with high-pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner.			
	64.00	(D) 25 Sq.mm.	15.00	Ea.	960.00
		SOR No. 4-7-1(D)			
12	25.00	Miniature circuit-breaker single pole 6A to 32A suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark	100.00	Ea.	2,500.00
		Make: L&T / Havells / C&S / Siemens			
		SOR-3-10-1			
13	90.00	Making a trench in the soft soil of suitable width of 90 cms deep for laying cable or locating the fault all over the run and backfilling the same and making the surface as a normal ground.	40.00	Mtr.	3,600.00
		SOR-4-5-1			
14	90.00	Covering of cable with second class bricks or cement tiles laid to cover the cable crosswise & on both sides with covering of 7.5 Cms. a layer of sand above & below cable (16 bricks per meter)	100.00	Mtr.	9,000.00
		SOR-4-5-3			

15	5.00	Supplying and erecting LED street light / Flood light fittings with high power White LEDs wattage of 1 Watt and above assembled on single MCPCB, efficiency more than 130 lm/w and corrosion free High pressure die cast aluminium housing with smooth finish powder coated and heat sink extruded aluminium with diffuser and Polycarbonate optics/ lenses with company mark/name engraved or embossed 120 to 300 V, Power Factor more than 0.95, THD < 10%, CCT 5000 K to 5700 K, Uniformity ratio > 0.45, Luminaire efficiency > 85 lumens/watt. LED driver efficiency > 85%. CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL / BridgeLux (U.S.A.) make LED used for luminaire. (Each fitting required LM-79 & LM-80 certificates).	7,110.00	Ea.	35,550.00
		(A) Street Light (IP-65), Surge - 4KV			
		(D) Above 36 to 48 watts			
		Cat - III			
		SOR No. 14-02			
				<b>Total Rs...</b>	<b>422,930.00</b>
				<b>Say Rs...</b>	<b>422,930.00</b>

I/ We am/ are willing to carry out the work at \_\_\_\_\_ % above/below percent (should be written in figures and words) of the estimated rates mentioned above. Amount of my/ our tender works out as under.

Estimated amount		Estimated amount	
Put to tender	Rs. _____	Put to tender	Rs. _____
Deduct _____% below	Rs. _____	Add _____% above	Rs. _____
Net	Rs. _____	Total	Rs. _____
In words _____		In words _____	

**Note**

1. All work shall be carried out as per Public Works Department Handbook and other specifications of PWD/CPWD/SVNIT or as directed.
2. All the columns are Scheduled to be filled in ink and the total of the entries in the last column should be struck by the contractor under his signature.
3. Rates quoted include clearance of site (prior commencement of work and at its close) in all respects and hold good for work under all conditions, site, moisture, weather etc.
4. To be continued on additional sheets, if found necessary.

**POSTAL ADDRESS OF CONTRACTOR**  
With E-mail ID

**SIGNATURE OF CONTRACTOR**  
**DATE:**



## SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT – 7

### D. MEMORANDUM OF WORKS

I / We \_\_\_\_\_  
of M/s. \_\_\_\_\_, (herein by referred to as Contractor) hereby undertake to execute for the Sardar Vallabhbhai National Institute of Technology, Surat – 395 007 (herein after referred to as the Institute) the work of Electrification/Installation of \_\_\_\_\_ of the Institute specified in the under written memorandum within the time specified in such memorandum at the quoted rates specified in schedule (Memorandum showing items of works to be carried out) in accordance in all respects, with the specifications, designs and terms and conditions as specified in this tender.

#### MEMORANDUM

- 1 Name of The Work : Streetlight work at Basketball ground, Activity center and other places at SVNIT, Surat.
- 2 Estimated Cost : Rs. 4,22,930.00 (Rupees Four Lakh Twenty Two thousand Nine hundred and Thirty only).
- 3 Validity of tender : The tender for work shall remain open for a period of 90 days from the date of opening of the tender for this works and that the tenderer shall not be allowed to withdraws or modify the offer on his own during this period. If any tenderer withdraws or makes any modifications or additions in the terms and conditions of his tender, not acceptable to the Institute, then the Institute shall without prejudice to any right on remedy be at liberty in full the said earnest money be forfeited absolutely.
- 4 Security Deposit : 10% of the total of the estimated cost, of which 5% i.e. Rs. 21,147.00 is to be deposited before the commencement of the work and remaining 5% will be deducted from the R.A. bills.
- 5 Time Limit : 3 months from the date of issue of the work order. The penalty @ Rs. 200.00 per lakhs per day shall come in force if the work is not completed within the specified time limit.

- 6 Income Tax : Income Tax with surcharge at the rate of 2.0% of the work executed will be deducted from the R.A. Bills/final bill or at the rate as per the prevailing rule of Income Tax in force.
- 7 Taxes & any other : As per Govt. rules.
- 8 Registration of Provident No. : The contractor will have also responsibilities for all employees and to get registered for the provident fund No. etc., for their employees and shall furnish the details of the same if required.
- 9 Labour Licence : The contractor shall obtain the labour license from the competent authority and will have to produce the copy thereof if required.
- 10 Extra Items : Extra item / Nonschedule item shall have to be executed  
 (i) At the rate of SOR/R.A. prepared on the basis of SOR of the year in which the item is to executed and  
 (ii) If such item is not available in SOR i.e. for Non-schedule item rate shall be decided on the of basis market rate analysis.  
 The percentage above/below shall not be considered in any of the above case (i) or (ii)
- 11 Electricity Charge : Institute has supplied the electricity for which 0.25% of the tender cost to be recovered from the R. A. Bill / Final Bill as an electric charge.
- 12 Labour Cess : 1 % of the actual bill will be deducted from the R. A. bill / Final bill.
- 13 Delectation and or reducing or increasing the quantity of any items : The Director is empowered to delete and or to increase the estimated quantity of any item as given in the Schedule – B to any extent irrespective of the ceiling either for saving or excess quantity compared to the quantities of such items of schedule – B during execution.
- 14 PAYMENT : No payment shall be made for the price escalation whatsoever for any materials and labour charges for the electrification / installation work of.

I / We further agree to make good at my/our own expense all defects in the Installation, which appears within 12 months from the date of bringing the Installation into beneficial use due to all defects in materials or in workmanship.

I / We hereby agree to abide by and fulfill all the terms and provisions of the conditions of the contract as specified in this tender documents.

In case of dispute, the decision of the Director, SVNIT, Surat – 7 shall be final and will be binding on me/us.

Name, address, E-mail : \_\_\_\_\_  
ID and Signature of Contractor \_\_\_\_\_  
E-mail: \_\_\_\_\_

Witness by 1 \_\_\_\_\_  
( )  
2 \_\_\_\_\_  
( )

Place: Surat  
Date:

The above agreement is hereby accepted by me on behalf of Sardar Vallabhbhai National Institute of Technology, Surat – 395 007.

Place: Surat  
Date:

**Signature of Contractor**

**DIRECTOR  
SVNIT, Surat**

**E. Checklist of documents to accompany the tender and for general information of Contractor for Submission of Tender**

Sr. No.	Brief details of documents required	Whether enclosed or not
(A)	The contractor must submit the following documents duly attested by Gazetted Officer/Notary valid on the date fixed for the receipt of tender.	
1.	Attested copy of the valid registration certificate of CPWD/ PWD/MES/MJP/Railways/P&T for civil as well as Electrical works.	Yes/ No
2.	Attested copy of the valid registration <b>certificate of GST department.</b>	Yes/ No
3.	Earnest Money in the form of Banker's cheque, Demand Draft, in favour of the "Director MHRD fund" of Rs. 12700/- valid for a stipulated period.	Yes/ No
4.	Attested copy of partnership deed/memorandum and articles of association, as the case may be if the tenderer is a partnership firm.	Yes/ No
5.	Power of attorney on behalf of firm issued in the name of person/s authorized to sign agreements/bills etc. and collect cheques from SVNIT for the work done.	Yes/ No

**Note:**

1. The information and documents must be attached in chronological order i.e. Sr. No.1 to 5.
2. The contractor must sign each and every page of all the document before submitting the tender document.

**Signature of Contractor**

**Director  
SVNIT, Surat**

## **SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT.**

### **F. IMPORTANT TERMS AND CONDITIONS:**

1. Each page of enquiry tender signed by the tenderer.
2. All material to be purchased as per specify makes only.
3. Testing of received electrical cables/wires switches gears, meters etc. Tested at (Electrical Engineering Department) Sardar Vallabhbhai National Institute of Technology, Surat or from recognized Institute may be as per Directive of Professor In-charge Electrical Systems. All testing charges born by the party if necessary.
4. The progress report should be given after every month to Professor In-charge Electrical Systems.
5. Execution of work including testing commissioning and handing over to Sardar Vallabhbhai National Institute of Technology within the stipulated time.
6. For electrical wiring, work contractor should co-operate with a civil contractor for electrical works.
7. All drawing required for work will be prepared by the contractor
8. Any plastering/ surfacing work by mortar/ POP includes in Electrical works.



capacity of the society issued by the Legal Assistant, Directorate of Cottage Industries will have to be produced along with the tender.

8. The several documents forming the contract are the essential parts of the contract and requirement occurring in one is as binding as though occurring in all, they are intended to be mutually explanatory and complementary and to describe and provide for a complete work.
9. In the event of any discrepancy the several documents forming the contractor in any one document the following order of procedure should apply:
  - (a) Dimension and quantities
    - (i) Drawing
    - (ii) Schedule 'B' of the tender form
    - (iii) Specification

On drawing figures, dimensions unless obvious in the contract will be followed in preference to sealed dimension.

- (b) Description:
  - (i) Schedule 'B' of the tender form
  - (ii) Drawings
  - (iii) Specifications

In case defective description or an ambiguity. The Professor-in-charge Electrical System should issue further instructions directing in what manner the work is to be carried out is being understood that the last modern practice is to be followed. The contractor should forthwith comply with such instruction.

10. The contractor should take no advantage of any apparent error omission in drawings or specifications and the Professor-in-charge Electrical System should be permitted to make fulfill the intent of the plans and specifications.
11. The tender for the work shall remain open for a period of 60 days (Sixty days) from the date of opening of tenders for the work. The offer having validity less than 60 days will be rejected outright. The tenderers will not be allowed to withdraw or modify the offer on his/their own during the course of finalization of tender.
12. The contractor shall employ only such labourers who shall produce a valid certificate of having been vaccinated against smallpox within a period last three years.
13. The contractor shall provide drinking water facilities to the workers/labourers employed on college work amenities relating to sanction shall also be provided to the workers, labourers to comply with the provisions, the Engineer-in-charge shall give notice facility of workers, labourers within a period of ten days from the date of the notice in the writing the Professor

Incharge Electrical Systems shall thereupon make the arrangement for the drinking water at the cost of the contractor.

14. The contractor shall provide the amenity of shade and shelter to the workers, labourers and their children of college work as soon as the work starts.
15. Receipt paid for earnest money should accompany the tender. Tenderer may pay earnest money in the form of crossed 'demand draft for fixed deposit receipts of deposit at call receipts or cash.
16. Wires of ISI make will be allowed to be used in the work.
17. The rates should be written both in words and figures inclusive of all taxes and duties.
18. The percentage additions in total amounting tendered or items are not allowed a however overall reduction in percentage is offered the same should be stated in the prescribed clause added at the end of schedule B in words and figures. If no reduction is to be made the gap should be filled in and the work 'NIL'.

Note: As per Govt. Reso. No.: CDN/1269/PAC/51-C, Dated: 15/04/1978.

19. Safeguards
  - (a) That the percentages and the tender amount quoted by each contractor shall actually show to the other contractors who may be present at the time of opening the tenders.
  - (b) That a tender with any erasures and/or over writings in percentage (both in word and in figures) shall be rejected outright.
  - (c) That insertions and or corrections in the percentage quoted (both in words and in figures) resulting into increase in the value of the work all be liable to be rejected outright unless is authenticated by the officer opening the tender at the time of opening tender as well as the contractors they may be present at the time of opening tender and
  - (d) That any other correction or insertions shall be authenticated by the officer opening the tenders and the intending bidders who may be present.
20. Wherever secured advance has been granted, the contractor should provide necessary signboard indicating the fact of hypothecation of the materials to the Govt./college and exhibited the same publically prominently.  
(Govt. in PWD Reso. No.: PWN-2675-IB-905-66-C, dated 30-11-77)
21. The contractor should give a written undertaking each while applying for the grant of secured advance case and every time in addition of the agreement indenture bond already prescribed to the effect that he has not taken or caused to be taken not shall be take or caused to be taken any advance on the same materials on which secured advance is applied for by any other person/firm corporation limited company or any financing institution like Bank



etc. by hypothecating or pledging the materials (Govt. in P.W.D. Resolution No. PWD-2675 B/905/66-C dated 30-11-77)

22. Any error in quantity or amount in Schedule 'B' showing items of works to be carried out shall be adjusted in accordance with the following rules:
- (a) In the event of a discrepancy between the description in words and figures quoted by a tenderer in the rates column, the description in words shall prevail.
  - (b) In the event of an error occurring in the amount column of the Schedule 'B' showing item of works, as a result of wrong multiplication of the unit rate and quantity the unit rate shall be regarded as firm and multiplication shall be amended on the basis of the rate.
  - (c) All errors in totaling in the amount column, and in carrying forward totals shall be corrected.
  - (d) Any rounding off of amounts against items of in totals shall be ignored. The tendered sum so latered shall for the purpose of tendered be substituted for the sum original tendered and considered for acceptance.
23. Income tax clearance certificate in a revised form should invariably be attached with the tender papers. Otherwise tender may not be consider.
24. Tenderer should give the list of work or works carried out by him mentioning the name of work, the name of the Institution where work, estimated cost of the work with the tender papers. Otherwise tender may not be consider.
25. (i) Late tenders (i.e. tender received after the specified time of opening), delayed tenders (i.e. tenders received before the time of opening but after the due date and time or receipt of tenders) and post tender offers shall not be opened and considered at all.
- (ii) The tenders received (by registered post) after the time of data specified in the tender notice shall not be received by the concerned office from the postman, for which date and time may be recorded on the cover of the tender as to when tender was refused.

Signature of Contractor/s

DIRECTOR  
S.V. National Institute of Technology,  
Surat - 395 007

Signature of Witnesses

Signature of Witnesses

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## **SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT – 7**

### **GENERAL CONDITIONS OF CONTRACT FOR ELECTRICAL WORKS GENERAL CONDITIONS OF CONTRACT**

#### **1. Definition of terms:**

In constructing these general conditions and the annexed specification the following words shall have the meaning here assigned to them unless there is something in the subject or context inconsistent with such constructions:

The “Director” shall mean the Director of Sardar Vallabhbhai National Institute of Technology, Surat – 7.

The “Director” shall include his successors and assigns.

The “Institute” shall mean the Sardar Vallabhbhai National Institute of Technology, Surat – 7.

The “Professor In-charge Electrical System” shall mean the Faculty Member In-charge Electrical System, appointed by the Director to supervise the work on behalf of the Director.

The “Contractor” shall mean the Tenderer whose tender shall be accepted by the college and shall include the tenderer’s legal personal representatives or successors and assigns.

‘Plant’ shall mean and include any machine, fixed or movable, used for the generation or transmission of power, or actuated by power.

“Work” or “Works” shall mean the whole of the plant and material to be provided and work to be done, executed or carried out by the contractor under the contract.

The “Contract” shall mean all the documents by which the agreement by the contractors to provided to execute or carry out the plant work or works shall be constituted or in or by which the terms of such agreement or any of them are contained or set for the specially including these General conditions, any special conditions attached to or issued, with these conditions, the specification, the drawings, the invitation for Tenders (if any) or any other letter, notice or document upon or with reference to which the Tender is made the Tender and the acceptance thereof, and the schedule of prices (if any) furnished by the contractor with his Tender.

The “Specification” shall mean the specification annexed to these General conditions and the Schedule thereto (if any).

The “Site” shall mean the whole of the premises buildings and grounds in or upon which the plant work or works is or are to be provided, executed, erected done or carried out.

The “Drawings” shall mean the drawings issued with the specification which will ordinarily be identified by being signed by the Engineer, and any further drawing submitted by the contractor with his tender and duly signed by him and accepted or approved by the Engineer all other drawings accordance with these General conditions.

The “Special conditions” shall mean the special conditions of contract (if any) attached to general conditions.

The "Schedule" shall mean the schedule or schedules attached to the specification.

**2. Contractor to inform himself fully:**

The contractor shall be deemed to have carefully examined the invitation for Tenders (if any) the general and any special conditions, the specification and Drawings and the Schedule of price (if any). In case of discordance or want of agreement between of amongst the several things herein described as the grounds or data or the contract, then these conditions shall have precedence of and he held to more correct and binding than the specification or any condition referred to therein, or in any other documents forming part or the contract, and in like manner detailed drawings shall be held to be more correct, and binding than general to teach drawings and in like manner drawings made to a large scale, or for special instruction, shall be held to be more correct and binding than drawing made to a smaller scale, or for general instruction, and figured dimensions shall be held to be more correct than dimensions by scale but subject nevertheless in case of doubt or dispute as to any of the matters aforesaid to the determination and decision of the Engineer as hereinafter is more particularly mentioned and provided always that nothing herein contained small limit the powers of the engineer herein after mentioned.

**3. Security Deposit:**

The contractor shall within ten days of the intimation to him of acceptance of a tender, deposit a sum equal to 10 (TEN) percent on the amount of the tender as security for the performance of the contract. This deposit shall be in cash if the amount does not exceed Rs.500.00 and if the amount exceeds Rs. 500.00 the amount equal to 5 percent shall be in cash or in approved securities, endorsed as may be required by the Engineer, of the same market value at date of the deposit as the amount fixed and the balance 5 percent shall be recovery from the R.A. Bills at 10% of each bill subject tom limit of 5% of tender amount. All damages, costs charges, expenses and other sums which may become due or payable by the contractor to the college under the terms of the contract may be deducted from the cash or paid out of the proceeds of sale of the securities so deposited. (which the officer or person to whom the same may be endorsed as aforesaid is authorized to sell for that purpose) or from the interest of any such securities or from any sums due or which may become due to him by the Institute the whole of the balance unapplied to aforesaid or the cash or securities so deposited being repaid or transferred and returned as the case may be to the contractor at the end of the period of maintenance provided for by clause 13 of these conditions. In the event of any and on the occasion of every such deduction or sale and payment as aforesaid the contractor shall forthwith make up in cash or such securities as after said the deficiency thereby occasional in the said security deposit.

**4. Mistake in contractor's Drawings:**

The contractor shall submit such drawings as may be required and shall be responsible for any discrepancies, errors or omissions in any drawings or other particulars supplied by him not withstanding that such drawings or particulars may have been approved by the Professor in-charge Electrical System.

**5. Patent Rights etc.:**

The contractor shall fully indemnify the Director against all actions, suits, claims, demands, costs, charges and expenses arising from or incurred by reason of an infringement, or alleged infringement, of any, letters patent, design, trade make or name copyright or other protected rights system or method or using, fixing working or arrangement used shall not extend or apply to any action, suit, claim, demand cost, charges or expenses arising from or incurred by reason of the use of the work or any part thereof otherwise than in the manner or for a purpose contemplated by the contract. All royalties and other similar payments which may have to be paid for the use of any such machine, plant, work, material, thing, system or method as aforesaid (whether payable in one sum or by installments or otherwise) shall be covered by the contract price and payable by the contractor.

In the event of any claim or demand being made or action or suit brought against the college in respect of any such matter or matters as all negotiations for the settlement of such claim or demand and such action aforesaid the contractor shall be duly notified, thereof, and he shall conduct or suit Director shall think proper to the supervision and control of the Director through the officer duly authorized.

**6. Subletting of Contract:**

The contractor shall not without the consent in writing of the Director under the hand of the Professor in-charge Electrical System assign or sublet the contract nor make any sub-contract with any person or persons for the executions of any portion of the work other than for raw materials, or for any part of the work of which the manufactures are named in the contract.

**7. Workmanship and Materials:**

The work shall be carried out in all respects with workmanship and materials of the best and most substantial and approved qualities to the entire satisfaction of the Professor in-charge Electrical System who may reject any plant, apparatus, material or workmanship which shall in his opinion be defective quality any such rejection to be final and conclusive. The contractor shall at his own expense provide all materials labour, haulage, power, tools, tackle and apparatus necessary to execute and complete the works and plant manner aforesaid.

**8. Use of work Pending Completion:**

The college shall be at liberty at any time to put into beneficial use the whole or any part of the work be may desire to use pending the formal completion and taking over of the same.

**9. Power to every or omit work:**

(a) The Professor in-charge Electrical System shall have full power, subject to the provision next hereinafter contained, from time to time before the works have been taken over by notice in writing otherwise vary any of the work, and any such order shall be without prejudice to the liability of the contractor under the contract, and the contractor shall carry out any alterations, amendments, omission, additions or variations so ordered and be bound in carrying them out by the same conditions (as far as applicable) as though the said alterations, amendments, omissions,

additions or variations, so ordered as aforesaid shall be difference of cost (if any) occasioned by any alterations, amendments, may required. The amount of such difference (if any) shall subject to the provision, hereinafter contained be ascertained and determined in accordance with the rates specified in the Schedule of price, so far as the same shall be applicable, but the College shall not become liable for the payment of any charge in respect of any such alterations, amendments, omissions, additions or variations unless the orders or instructions for the performance of the same shall have been given in writing by the Professor in-charge Electrical System.

- (b) Tendered work shall apply for excess upto a max. of 30.5% over the tendered any.
- (c) For excess, any beyond 30% payment shall be made as per mutually agreed ones. However, the agency will furnish the conclusive evidence of the rates of the conclusive evidence of the rates of the involved components of exceeding items prevailing on the date of commencement of execution of that item, and the rate prevailing on the date of exceeding excess.

**10. Protection and liability for accidents, Theft and damage:**

The contractor shall at all times until the commencement of the period of maintenance as provided in clause 13 properly and sufficiently cover up and protect all materials delivered on site from damage or injury by exposure to the weather and damage or injury to the same from any cause. The contractor shall be and remain answerable and liable for all accidents of maintenance as provided for under clause 13 may arise or be occasioned by the acts or omissions of the contractor or his workmen, agents, servants or sub-contractors and all losses and damages arising from such accidents damage or in juries as substantial manner by and at the sole cost of the contractor and to the satisfaction of the Professor in-charge Electrical System.

Provided that should the Professor in-charge Electrical System certify that the work has been completed but that owing to circumstances over which the contractor has no control the work cannot be taken or damage to the work occasioned by such delay in taking over and occurring more than one month after the date of completion of the work as certified by the Professor in-charge Electrical System.

Until the work shall be or deemed to be taken over as hereinafter provided the contractor shall also indemnify to College from and against all claims and demands suits, proceedings costs and expenses in respect of or in connection with any injury to person or damage to property by whomever sustained by the acts or omissions of the contractor or his workmen or sub-contractor or by defective design work or material made done furnished or supplied by the contractor. The contractor shall also be responsible for thefts of any property of the college or of others committed by any employee of his own or his sub-contractors and shall be liable for the cost of replacing any property stolen.

**11. Insurance:**

Subject as hereinafter provided the contractor shall at his own expense insure and at all times prior to the commencement of the period of maintenance keep insured against destruction of damage by fire or earthquake storm and tempest such plant and materials ordered for the work as may for the time being be upon the site for the full value of such plant & materials.

**12. Materials brought on the site:**

All materials tools, and tackle brought to and delivered upon the site for the purpose of work shall be from the time of their being so brought vest in and be the property of the Institute but may be used for the purpose of the work but for that purpose only and not on any account be removed to taken away by the contractor or any other person without the express permission in writing of the engineer, but the contractor shall nevertheless (Subject as herein after provided) be solely liable and responsible for any loss or destruction thereof or damage thereto unless resulting from causes beyond destruction or damage from which is provided for in clause 11. The Institute shall have a lien on such material tools and tackle for any sum of sums which may to any time prior to the completion of the work be due or owing to him by the contractor under in respect of or by reason of the contract and shall be at liberty to sell and dispose of any of such materials, tools and tackle remaining after the completion of the proceeds in or towards the satisfaction of such sum or sums so due or owing as aforesaid but subject to such lien and power of sale and disposal of such surplus materials, tool and tackle shall belong to the contractor and may be removed and disposed of by him as he shall think fit.

**13. Default:**

If the contractor shall at any time fail in the opinion of the Professor in-charge Electrical System to proceed with the work with due diligence and expedition or shall refuse neglect or omit to comply with any orders given him in writing by the engineer in accordance with the provision of these conditions or shall commit any other breach of the provision of the contract, the engineer shall be at the liberty to give notice in writing to the contractor to make good the failure neglect, omission or comply with any such notice within such period as may be prescribed in such notice within such period as may be prescribed in such notice then and in such case the Director shall be at liberty to employ workmen other than those of the contractor to perform and execute the work in respect of which the failure neglect or omission referred to in such notice shall have been committed or occurred, if the Director shall be think fit it shall be lawful for him to enter into a new contract with any other persons, or person for the execution of such part of the work as may not have been executed and in

That event the Director shall without incurring any liability to the contractor be entitled to use all or any of the materials, tools, tackle or other things which may then be on the site for the purpose of completing the work or any part thereof and to provided additional materials, tools or tackle required for the purpose and the cost of executing any such work and providing any such materials shall be paid by the contractor to the college on demand.

Subject to and after satisfaction of the lien of the college for any sum due to him by the contractor for any expenses, cost or charges incurred in the completion of the work, all materials, tools tackle or other things remaining on

the site and unsold after such completion shall forthwith hereafter be removed by the contractor.

**14. Replacement of defective work or material:**

If during the progress of the work the Professor in-charge Electrical System shall notify in writing to the contractor that in his opinion the contractor shall execute any unsound or imperfect work, or has supplied any materials inferior in quality to those stipulated for by the contractor, the contractor shall at his own expense, within 10 days of his receiving the notice, proceed with due expedition to remove or after and reconstruct or replace the work, or as the case may be supplied fresh materials up to the standard of the specification, in place of the work or materials complained of by the notice (as the case Director may after the expiration of ten days from the giving to the contractor of a further notice in writing stating the college intention so to do forthwith at the cost of contractor remove the work or materials complained of and perform all such work or (as the case may be) supply all such materials in place of those complained of as may be necessary or proper in order to comply with the contractor and the cost as certified by the Professor in-charge Electrical System of any such removal and performance of work or supply of materials shall be paid by the contractor to the college on demand, provided always that nothing in this clause shall be deemed to deprive always that nothing in this clause shall be deemed to deprive the college or effect any other rights or remedies under the contract or otherwise which he may have in respect of such defects or deficiencies. No payment which have been made on account of materials delivered or work executed shall looked made on account of materials delivered or work executed shall looked on as acceptance of such or any work or materials.

**15. Cutting away & making good:**

The tender is to include all necessary cutting and making good for the purpose of the contract of the wood work walls, floors etc. of the site. The contractor will be held responsible for, and will have to make good at his own expense, to the satisfaction of the Professor in-charge Electrical System, any damages to or disfigurement of the site which may have been caused by the acts or omissions of himself or his servants or agents in connection with the carrying out of the contract.

**16. Maintenance: (Clause 16)**

The contractor shall make good at his own expense all defects due to faculty design materials or workmanship on the part of the contractor which may during period of 6 calendar months from the date on which the work is certified by the Professor in-charge Electrical System to have been brought into beneficial use or if no such certificate is given, from the date to the final payment for the work under clause 20. (which period is hereinafter called the "period of maintenance") develop under proper use in the work or any part thereof by replacing plant materials or work or otherwise as may be necessary. Any such making good by the contractor shall in no case relieve him from his liability to make good any further defect in the work made good of replaced which may develop during the reminder of such period of twelve months. If any such defects are clearly, caused by the fault of the contractor and are liable to recurrence the contractor shall make such alterations as are

required to prevent any recurrence of such defects. If any defects or alteration which the Contractor shall become liable to make good or make under this clause be not made good or made (as the case may be) within such time as the Professor in-charge Electrical System may prescribe for the purpose, the Professor in-charge Electrical System may proceed to make good or make the same (as the case may be) at the risk and expense of the Contractor, but without the Director may have against the Contractor in respect of his default in making good or making the same as aforesaid and the cost of any such making good or making shall be paid by the Contractor to the college on demand.

**17. Contractor's representative & workmen:**

The Contractor shall employ at least one competent representative, whose name or names shall have previously been communicated in writing to the Professor in-charge Electrical System by the Contractor so Superintend the carrying out the works. The said representative, or if more than one shall be employed then, one of such representatives, shall always be present on the site during working hours and any written orders or instructions which the Professor in-charge Electrical System or his duly authorized representative, whose name shall have been previously communicated in writing to the Contractor, may give to the said representative of contractor, shall be deemed to have been give to the Contractor.

The Professor in-charge Electrical System shall be at liberty to object to any representative or person employed by the contractor in the execution of or otherwise about the works who in the Professor in-charge Electrical System's opinion shall misconduct himself or be incompetent or negligent and the contractor shall remove every person so objected to forthwith upon receipt from the Professor in-charge Electrical System of notice in writing requiring him so to do.

**18. A minimum age of persons employed:**

- (i) The contractor shall not employ any person who is under the age of 12 years.
- (ii) If contractor does not accept the proceeding condition (i) his tender shall not be accepted and his name shall be removed from the list of contractors.
- (iii) The Engineer shall remove from the work any person found working which does not satisfy these conditions and to responsibility shall be accepted by the college for any delay caused in the completion of the work by such removal.

**19. Submission of samples:**

The contractor shall not without written sanction of the Professor in-charge Electrical System use for the execution of the work any materials, plant or stores of any type of description other than those specified in his tender. He shall, if required to do so, or at his options, deposit samples, at the office of the Professor in-charge Electrical System for approval and the Professor in-charge Electrical System shall, within 14 days of the receipt of the samples, express in writing to the contractor his approval or otherwise of the samples deposited, and all materials plant and stores used in the execution of the work



must be in every way equal to the deposited samples. All samples deposited will be returned to the contractor within one month of the work being taken over.

**20. Deduction from contract price:**

The amount of all costs of works, expenses or other sums which under the contract shall be payable by the contractor to the Director from any moneys due or becoming due by him to the Contractor under contract, without prejudice to the Director, right to recover the same by the ordinary process of law.

**21. Terms of payment: (Clause 20)**

Subject to any deduction which the Director may be authorized to make under the Contractor, the Contractor shall be entitled upon the certificate of the Professor in-charge Electrical System to the effect hereinafter stated payments of R.A. Bills shall be made to the Contractor as per items, in measurable units executed according to the specification.

If at any time the contractor shall be prevented for any period of not less than 30 days from causes within the control of the Director either, first, from delivering on the site any plant of material ready in India for delivery or secondly from proceeding with the erection at any plant or materials which he had already delivered on the site, the college shall bear the cost of storage and protection, including ignorance in accordance with clause 11, of the plant and material during such period. In the first of such cases the Contractor shall be entitled to payment of 80% of the value certified as be entitled of the plant or materials the delivery of which aforesaid of the plant or materials the delivery of which shall have been so prevented within one month from the date on which as certified by the Professor in-charge Electrical System such plant or material are so ready as aforesaid provided that all portions thereof have been suitably and sufficiently marked as being the property of the college and are delivered into the custody of some person approved by the Professor in-charge Electrical System who has granted a receipt thereof.

Installment shall be due and payable by the college within one month from the date of each certificate of the Professor in-charge Electrical System.

Any sum of money due and payable to the contractor (including the security deposit returnable to the contractor) under this contract shall be appropriated by the director add shall be set off against any claim of the director for the payment of a sum of money arising out of under any other contract made by the contractor with college. When no such amount for the purpose of the recovery from the contractor against any claim of the college is available. Such recovery shall be made from the contractor as arrears of land revenue.

**22. Certificates of Engineer:**

Every application to the Engineer for a certificate must be accompanied by a detailed claim (in duplicate) setting forth (in the order of the Schedule of price if any) particulars of the plant or materials delivered and work executed to the date of the claim, and the certificate as to such of the plant and work mentioned in the claim as is in the opinion of the Engineer in accordance with the contract shall be issued within 14 days of the application. No application for a certificate shall be made within 14 days of previous applications.

**23. Certificate not to affect rights of the college or contractor:**

The Engineer may be any certificate make any correction or modification in any certificate previously issued by him, any payment shall be regulated and adjusted accordingly. No certificate of the Engineer shall, nor extension of time for the execution of the works by the contractor which may be granted by or on behalf of the director affect or prejudice any of the rights of the Director against the contractor under or relieve him any of his obligations for or in respect of the due performance of the contract, or interpreted as approval of work done or of material supplied.

**24. Suspension of work:**

The institute shall pay to the contractor all proper expenses arising from suspension of the works by order in writing of the Engineer or any other officer on behalf of the institute unless such suspension be due to some default on the part of the contractor or any sub-contractor under him.

**25. Damages for delay in completion:**

If the work shall not be duly completed within the time fixed by contractor or any extension thereof which may be granted to the contractor and if but for the above failure, of the contractor the institute would have been able to make efficient use of the works and the contract price of the work shall be reduced by a sum equal to two percent of the value as ascertained by the Professor in-charge Electrical System's Certificate which shall be final of such portion of the work as in consequence of the delay cannot in the Engineer's opinion be used efficiently for each week, or part of a week between the stipulated date for completion (as the case may be) and the actual time taking over, provided that such deduction shall not exceed 20% of the value so as certain of such portion of the work, as aforesaid, provided also that nothing in this causes shall prejudice or affect the rights given to the director by clause 13 of these conditions.

Provided also that if any plant and materials for the execution of the work shall have been specified in the tender as having to be contained outside India are actually so obtained and cannot ordinarily be obtained in India the reduction week of the contract price to be made as hereinbefore provided for any delay in the delivery such materials shall be half of one percent, instead of 2 percent.

**26. Condition 24 - A**

If the contractor shall desire an extension of time of the time for completion of work on the ground of his having been unavoidably hindered in it execution or any other ground he shall apply in writing to the director before the expiration of the period stipulated in the tender or before expiration of 30 days from the date on which he was hindered as aforesaid on which the cause for making for extension occurred, whichever, is earlier and the Director may if in his opinion, there are reasonable and bonafide grounds for granting, an extension grant such extension as he thinks necessary or proper. The decision of the Director in this matter shall be final.

No application for extension of time for completion of work shall be considered unless it is received by registered post in the office of the Director or left at his

office and obtained receipt thereof duly signed by the Director or his nominee authorized in this respect.

The date of receipt of application by the Director shall be considered as the date of application for the purpose of counting the period as mentioned above.

**27. Condition 24 – B**

If the contractor or his workmen, or servants shall break deface, injure or destroy and part of the building, or the work in question in/or which they may be working or any buildings, road, fence, enclosure or grass-land or cultivated ground contiguous to the premises on which the work or any part thereof is being executed or if any damage shall be done to the work from any cause whatever before completion of the work or before the completion of the maintenance period whichever is later or any damages occurred/caused due to normal flood or rain or if any imperfection become apparent in it within three months from the grant of a certificate of completion, final or otherwise, by the Professor in-charge Electrical System in-charge, the contractor shall make good the same at his own expenses or in default, the Engineer-in-charge may cause the same to be made good by other contractor, and deduct expenses (of which the certificate of the Professor in-charge Electrical System-in-charge shall be final) from any sums that may then be due or may thereafter become due to the contractor or from his security deposit or the proceeds of sale thereof a sufficient portion thereof.

**28. Condition 24 – C: Force Majour Clause**

However, neither party shall be liable to the other for any loss or damage occasioned / caused by or arising out of acts of god, and in particular, Unprecedented floods, volcanic corruption, earth quake or other convulsion of nature and other acts such as but not rusticated to, invasion, the act of foreign countries hostilities or warlike operations before or after declaration of rebellion military or usurped power which prevent performance of the contract and which could not have been foreseen or avoided a prudent person.

**Note:** “Unprecedented Flood” means the flood crossing the high flood crossing the high flood level of the past year(s) which is on the available record.

**29. Time of Taking Over:**

The work shall for the purpose of all the provisions of these conditions be deemed to have been completed and taken over by the institute when the Engineer, shall have certified in writing that it has been completed in accordance with the contract conditions and such Certificate shall not be unreasonable withheld nor shall the Engineer delay its issue on account of commissions or defects which in his opinion do not effect the efficient use of the work, but such issue shall be without prejudice to the contractor's liability to make good any such omissions and defects with the greatest possible expedition.

**30. Death & Bankruptcy:**

If the contractor shall die or become insolvent, or bankrupt or have a receiving order made against him or compound with or make any proposal carrying on his business under inspection or for the benefit of his creditors, or commit on act of insolvency are bankruptcy, or being a corporation be ordered to be wound up or have a receipt of its business appointed by the Director shall be entitled forthwith by notice in writing to the contractor his legal representatives to determine the contract and the Director may in that event complete the contract in such time and manner and by such person as he shall think fit.

- 31.** Appointment of a single sole arbitrators shall be appointed by a mutual consent, to adjudicate only commercial disputes. Arbitrator will have no jurisdiction over technical issues for which the decision of Electrical Inspector (IM&E Dept.) will have to be considered final and conclusive.

(The following clause are to be deemed included in this conditions only when Plant or Machinery is included in the contract).

**32. Contract Drawings:**

The contractor shall submit to the Professor in-charge Electrical System for his approval on or before the dates stipulated for this purpose in the Specification, copies, of all the drawings of the general arrangements of the plant as set out therein and of such detail drawings as may be reasonably necessary.

Within 14 days from the receipt, by him of such copies the Professor in-charge Electrical System shall signify his approval or otherwise of the same and if he does not do so he shall be deemed to have approved thereof.

Within 14 days from the notification by the Professor in-charge Electrical System to the contractor of his approval such copies or in the absence of such notification within 30 days for the receipt of such copies, the copies in ink on tracing cloth or ferrogallic prints mounted on cloth of all the drawings as approved shall be supplied to the Professor in-charge Electrical System by the contractor respectively and shall thereupon be signed by the contractor and become the property of the Institute.

Such signed copies of the drawing shall not be departed from in any way whatsoever except with the written permission of the Professor in-charge Electrical System during the execution of the works one of the signed copies shall be always kept available for reference on the site.

In the event of the contractor desiring to keep in his own possession a signed copy of the drawings as approved he shall supply three copies instead of two and in this case the Engineer shall sign the third copy and return the same to the contractor.

**33. Manner of Execution Quality of Materials etc.:**

The plant shall be manufactured constructed provided, put in position and maintained in the best and most substantial and workmen like manner and materials of the best and most approved qualities having regard to their respective uses.

- 34.** In all cases where the special conditions provide for tests on the site whether of plant materials or workmanship the Institute except where otherwise specially stipulates free of charge such labour materials fuel, stores, apparatus and instruments as may be requisite from time to time efficiently to carry out such tests in accordance with the condition.

Where electrical energy is required for tests on site and a supply is available on the site from an existing installation such electrical energy shall be supplied to the contractor by the Institute free of charge at the pressure and frequency of the ordinary supply is available the electrical energy necessary for such tests shall be provided by the contractor.

**35. Delivery of Plants & Materials:**

No plant or materials shall be tendered for delivery until an intimation in writing shall have been given to the contractor by the Engineer that the Director is ready to take delivery.

**36. Tests on Completion:**

On the completion of the works on the site in accordance with the contract the contractor shall give the Engineer notice in writing of such completion. The Engineer shall after receipt of such notice by notice in writing under his hand fix date and an hour on that date for the making of the tests on site if any such are provided for by the contract.

The contractor shall carry out such tests upon the date and at the hour so fixed and if the Engineer or his authorised representative shall attend on that date at that hours such test shall be carried out in the presence of the Engineer or such representative.

If any portion of the plant fails under the tests to satisfy the contractor conditions similar tests according to the contract of the portion so failing shall if required by the Engineer or by the contractor be repeated within a time to be fixed by the Engineer and the provisions of this clause shall apply to such repeat 20 tests as if they were the original tests and the contractor shall pay to the Director all reasonable expenses to which he may be put by such tests.

If the tests or any repeated tests so required as aforesaid be not made by the contractor on the date fixed as aforesaid for the same by the Engineer may proceed to make such test himself at the contractor's risk and expense.

If in any test under this clause the plant tests shall fail to satisfy the contractor conditions the Director shall as from the date stipulated by the contract for completion nevertheless have the right of using such plant until the same shall satisfy such conditions and such use shall be at the contractor's risk. In the event of the question whether the works have been completed in accordance with the contract or any question regarding such completion being submitted to Arbitration as herein before provided the Director may pending such Arbitration use any portion of the Plant the Engineer may certify to be capable of being used on condition of paying to the Contractor a sum calculated (according to the period of the user) at the rate of 5 percent annum upon the amount withheld or deducted in respect to such plant.

**37. Rejection of Defective work:**

If the works, or any portion thereof, shall not in the opinion of the Engineer on the stipulated tests (if any) being made in accordance with the contractor satisfy the contractor conditions within three months after the date stipulated for completion the engineer may give notice in writing to the contractor setting for the particulars of the defects or particulars in respect of which the works in his opinion fail to comply with the contract conditions and requiring the contractor to make good, alter or replace the same within such time to be specified in the notice as the engineer may consider reasonable and the contractor shall make good, alter or replace the same as required by such notice and so as to make it comply with the requirements of the contract conditions within the time so specified. Should he fail to do so within that time the Director may make good, alter or replace the same as so required and the cost of such making alteration good or replacement (less in the case of any replacement any sum which would have become due to the contractor under the contract in respect of the works replaced and which shall not have been paid to him) shall be paid by the contractor to the Director on demand or should the Director not make good, alter or replace any defective works in respect of which such notice as aforesaid shall be given within six months from the date of the giving of such notice the contractor shall repay to the Institute all sums (if any) paid by him to the contractor in respect of such works. Nothing in this clause contained shall prejudice or affect the rights of the Director under the contract whether in the way of enforcement of penalties or otherwise in respect of any delay in the completion of this work.

**38. Use of plant or works pending making good:**

If at expiration of the time specified for making good, altering or replacing the plant or works in any notice given by the engineer to the contractor under the last preceding clause the contractor shall not have duly made good, altered or replaced the same in accordance with the contract the Director shall be at liberty if he thinks fit to make use of the same for such time as shall be reasonably sufficient according to the circumstances to enable him, to make good alter or replace the same (whichever he may see fit to do) provided that in respect of the period of such user. The Director shall not be entitled to any damages under clause 25 of these conditions shall be entitled to be paid in a reasonable sum for the same.

**39. Workmen's Compensation in case of Injury:**

The contractor shall be responsible for any shall pay any compensation to his workmen payable for injuries under the workmen's Compensation Act, 1923 (VII of 1923) hereinafter called the said Act. If such compensation is paid by Institute as Director under subsection (1) of section 12 of the said Act. On behalf of the Contractor, it shall be recoverable by Government from the contractor under subsection (2) of the said section. Such compensation shall be recovered in the manner laid down in clause 3 and 20 or the condition of contract.

**40. The Contractors:**

The contractors shall afford or procure as the case may be every facility to Indian apprentices for practical training in the factories, workshop or offices owned managed controlled or patronized by them, so as to enable the Indian Apprentices to acquire full knowledge of the technique and work of their trade industry, calling or profession.

**41. Clause 4A, 43A.:**

Any some of money due and payee to the contractor (including the security deposit returnable to the contractor under this can tract shall be appropriated by the Government and shall be set or against nay claim of the Institute for payment of a sum of money arising out of or under any other contract made by the contractor with the Government when no such amount for purpose of the recover fro the contractor against any claim of the Government is available such a recovery shall be made from the contractor as arrears of land revenue.

**42. Clause 49 – 48:**

The contractor should as far as possible obtained his requirement of labourers skilled and unskilled from the nearest employment exchanges, so as to utilize the local employment potential. If there are no local employment exchange or such exchanges are not able to provide the required labourers locally suitable labourers should be utilized to his maximum extent possible.

**43. Clause No. 49 (36): FAIR WAGES:**

If a contractor fails to pay within '7' (Seven) days to the labourers (s) worker(s) the minimum wages prescribed by the Government under the Minimum Wages Act, 1949 as force from time to time the Engineer, or the office of a equal rank shall be at liberty to deduct the amount payable to the labourers/workers from his (contractor's) bills or deposit (s) payable by the contractor after making an inquiries and shall not be entitled to may payable payment or compensation on account of any loss that no (contractor) may have to incur on account of action as aforesaid before the action as aforesaid is enforced notice in writing to the contractor shall be issued by the Engineer, or the officer of the equal rank to pay the wages as per Minimum Wages Act in force at the relevant time if the contractor does not act as aforesaid within seven days than the action contemplated as above shall be taken against him.

**Signature of Contractor**

**Director  
SVNIT, Surat**

**SPECIFICATION FOR ELECTRICAL WORKS IN GOVERNMENT BUILDING  
SUBJECT TO THE GENERAL CONDITION OF CONTRACT IN FORCE  
(1986)**

**GENERAL**

**1. Wiring Rules:**

The installation generally shall be carried out in conformity with relevant Indian Standard Specifications and code of practices prevalent, Indian Electricity Rules 1956 and Indian Electricity Act 1910 as amended from time to time.

**2. Definition:**

The definition of terms shall be in accordance with Indian Standard code of practice for Electrical Wiring Installation IS-732 – 1982 except for the definition of point in case of Internal Electrical Installation. For definition of point wiring a measurement of Electrical Works IS-5908-1970 shall be referred to.

**3. Voltage and frequency of Supply:**

All current consuming devices shall be suitable for frequency of 50 C/s and system of voltage meant for unless otherwise specified.

**4. Layout of wiring and its description:**

- i. The wiring shall be carried out as per Schedule, "Power" wiring must be in screwed conduit and shall be kept separate and distinct from lighting wiring. All wiring must be done on the distribution system with main and branch distribution boards at convenient centres and without isolated fuses. All conductors shall be run as far as possible along the walls and ceilings as to be early accessible and capable of being thoroughly inspected. The balancing of circuits will be arranged before hand by the Engineer.
- ii. Within one month of the taking over of the installation. The contractor shall supply to the Resident Engineer, a complete set of wiring diagrams of the same on drawings to be supplied when available, by the Resident Engineer and to the satisfaction of the Prof in-charge Electrical System and these wiring plans shall be "Drawings" within the meaning of the term as used in the General Conditions of contract.

**5. Conductors:**

All conductor unless otherwise specified shall not be less than 1.5 Sq. mm. for point wiring and 2.5 Sq. mm. for mains. Conductors for power and lighting circuits shall be of adequate size to carry the designed circuit load without exceeding the permissible thermal limits for the installation and such sizes will be stipulated in specifications and or drawings

**6. Cables:**

All Cables shall conform to relevant Indian Standards.

Conductors of all cables except the flexible cable shall be of aluminium unless otherwise not specified unless otherwise not specified. The smallest aluminium conductor for the final circuit shall have a nominal cross sectional area not less than 1.5 Sq.mm. (1 mm<sup>2</sup> for copper). The minimum size of the aluminium conductors for power wiring shall be 4 Sq.mm. (2.5 Sq. mm. for copper)



- 6.3.1 Conductors of flexible cables shall be of copper. The minimum cross sectional area of such a cable shall be 14.0193 mm. The flexible cable shall have uniform and adequate insulation.
- 6.3.2 Unless the flexible cables and conductors are protected by armour or thought rubber or PVC Sheath, these shall not be used in workshops and other places where they are liable to mechanical damage.
- 6.3.3 Core flexible cables shall be used for connecting single phase appliances for phase, neutral and earth connections.

**7. Feti of potention**

The cross sectional area of all conductors inside buildings shall be so proportioned to their lengths that the drop in voltage between main fuses and the fortheft point or any lamp shall not exceed three percent the voltage of the consumer's with all the consuming devices in use.

- 7.1 If the CABLE SIZE is increased to avoid the voltage drop in circuit current rating of the cable shall be more than that for which the circuit is designed. In each circuit or sub circuit every cable shall have a current rating not less than of the fuse which protects the circuit or sub circuit respectively for current higher than the full load current.

**8. Ratings of lamps and fans socket out lets: Points and exhaust fans:**

Incandescent lamps installed in residential and non-residential buildings shall be rated at 60 watts and 100 watts respectively.

Table fans and ceiling fans shall be rated at 60 watts exhaust fan shall be rated according to their capacity.

5 Amp. Socket outlet pints and 15 Amp. Sockets outlet points shall be rated at 100 watts and 1000 watts respectively for the purpose of load assessment unless actual values of the load ade known or specified.

**9. Tests:**

- 9.1 Before the installation is commissioned following tests shall be carried out.

- 1) Insulation resistance test.
- 2) Polarity tests of switches.
- 3) Earth continuity tests.
- 4) Earth electrodes resistance test.

- 9.2.1.1 The insulation resistance shall be measured between earth and the whole system of conductors or any section there of with all fuses in place and all switches closed, and except in earthed concentric wiring all lamps in position or both poles of the installation otherwise electrically connected together a direct current pressure of not less than twice the working pressure provided that it need not exceed. 500 volts for medium voltage circuits where the supply is derived from the three wire D.C. or a poly phase. A.C. System, the neutral pole of which is connected to earth either direct or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

- 9.2.1.2 The insulation resistance shall also be measured between all conductors to one pole or phase conductor of the supply and all the conductors connected to the neutral or to the other pole or phase conductors of the supply with all lamps in position and switches in 'OFF' position and its value shall be not less than specified in Sub-Clause 9.2.1.3.
- 9.2.1.3 The insulation resistance in Megohms measured as above shall not be less than 50 Megohms divided by the number of outlets or when PVC insulated cables are used for wiring 12.5 megohms divided by number of outlets.
- 9.2.1.4 Where a whole installation is being test, a lower value than that given by the formula, subject to a minimum of 1 megohm is acceptable.
- 9.2.1.5 A preliminary and similar test may be made before lamps etc. are installed and in this event the insulation resistance to earth should be not less than 100 megohms divided by the number of outlets or when PVC insulated cables are used for wiring 25 megohms divided by number of outlets.
- 9.2.1.6 The term "Outlet" includes every switch except that a switch combined with a socket outlet, appliance or lighting fitting is regarded as one outlet.
- 9.2.1.7 Control rheostat heating and power appliances and electric sign may, if required, be disconnected from the circuit during the test, but in that event the insulation resistance between the case or frame work, and all live parts of each rheostat, appliance and sign, shall be not less than that specified in the relevant Indian Standard Specification or where there is no such specification shall be not less than half a megohm.
- 9.2.2 Polarity Test.
- 9.2.2.1 In a two wire installation a test shall be made to verify that all switches in every circuit have been fitted in the same conductor through out & such conductor shall be labelled or marked for connection to the phase conductor or to non earthed conductor of the supply.
- 9.2.2.2 In a three wire or a four wire installation a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is label led or marked for connection to one of the phase conductor of the supply.
- 9.2.2.3 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to the earth. Glowing of test lamp to its full brilliance, when the switch is in 'on' position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.
- 9.2.3.1 Earth Continuity Test:  
The earth continuity conductor including metal conduits and metallic envelops of cables in all cases shall be tested for

electric 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.

9.2.3.1 Earth Elecorde Resistance Test:

Earth elecorde Resistance test may be carried out by Megger Earth Testers containing a direct reading ohm-meter, a hand driven generator and auxiliary electrodes.

9.3 On completion of an electric installation (addition and alteration) a certificate shall be furnished by the contractor countersigned by the certified Supervisor under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as given in Appendix – 'B' in addition to the test certificate required by Local Electrical Supply Authorities.

**10. Joint and loopings back:**

Unless with the sanction of the Professor in-charge Electrical System all joints in conductor 'shall be made by means of approved mechanical connectors in suitable and approved boxes but looping back system shall be preferable. In wiring unless otherwise specified Phase and live conductor shall be looped at the switch box where as in neutral conductor can be looped from light, fan or socket outlet. In non-residential buildings, neutral and earth continuity wire shall be brought to each of the switchboards and terminated therein with suitable connectors. Switchboards should be of adequate size to accommodate at least one number of 5 Amps. socket outlet and control switch in future.

**11. Switches:**

Main Switches, Switch Board and their location:

- 11.1 All main switches (other than those of iron clad pattern) carrying current of 10 Amp. And above shall be fitted for back connections and shall be suitably protected.
- 11.2 All switches and circuit breakers shall be constructed in accordance with the I.S. 4237-1967 General requirement for switchgear and control gear for voltage not exceeding 1000 volts and other relevant I.S. provided also that spring shall be either of phosphor bronze or if steel shall be copper or Nickel plated and that handle shall be so fastened that they do not tend to unscrew or become loose.
- 11.3 All main switches shall be either of metal clad enclosed pattern or of any insulated enclosed pattern, which shall be fixed at close proximity to the point of entry of supply.
- 11.4 Switchboards shall not be erected above gas, stoves, or sinks or within 2.5m of any washing unit in the washing rooms of laundries or in the bathrooms lavatories, toilets or kitchens.
- 11.5 Switch boards, if unavoidably fixed in places likely to be exposed to weather, to drip, or to abnormal moist atmosphere the outlet casing shall be weather proof and shall be provided with glands or bushing or adopted to receive screwed conduit according to the manner in which

cables are run. PVC and double-flanged bushes shall be fitted in the holes of the switches for entry and exit of wires.

- 11.6 A switchboard shall not be installed so that its bottom is within 1.25 m above the floor unless the front of the switchboard is completely enclosed by a door, or the switchboard is located in a position to which only authorized persons have access.
- 11.7 Switchboards shall be recessed in the wall if so specified in the schedule of work or in the special specification. The front shall be fitted with hinged panel of other suitable material such as Bakelite in wood frame with locking arrangement, the outer surface of door being flush with the walls. Ample room shall be provided at the back for connections and at the front between the switchgear mountings and the door.
- 11.8 Equipments which are on the front of the switch board shall be so arranged that inadvertently personal contact with live parts is unlikely during the manipulation of switchgears, changing of fuses or like operations.
- 11.9 No holes other than the holes by means of which the panel is fixed shall be drilled closer than 1.3 cms. from any edge of the panel.
- 11.10 The various live parts, unless they are effectively screened by substantial barriers of non-hygroscopic, non-inflammable insulating
- 11.11 The arrangement of the gear shall be such that they shall be readily accessible and their connections to all instruments and apparatus shall also be traceable.
- 11.12 In every case in which switches and fuses are fitted on the same pole, these fuses shall be so arranged that the fuses are not alive when their respective switches are in the off position.
- 11.13 No fuses other than fuses in instrument circuit shall be fixed on the back of or behind a switchboard panel or frame.
- 11.14 All the metal switchgears and switchboards shall be painted prior to erection with one coat of antirust primer. After erection they shall be painted with two coats of approved enamel or aluminium paint as required on all sides wherever accessible.
- 11.15 All switchboards connected to medium voltage and above shall be provided with 'Danger Notice Plate' conforming to relevant Indian Standards.

## **12. Control at Point of Commencement of Supply:**

- 12.1 There shall be a linked main switchgear with fuse on each live conductor of the supply mains at the point of entry. The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of a linked switchgear. The neutral shall also be distinctly marked. In this connection Rule 32(2) of the Indian Electricity Rules (See Appendix 'A') shall also be referred.
- 12.2 The main switchgear shall be situated as near as practicable to the termination of service line and shall be easily accessible without the use of any external aid.

12.3 On the main switchgear, where the conductor of a two wire system or an earthen neutral conductor of a multi wire system or a conductor which is to be connected thereto, an indication of a permanent nature shall be provided to identify the earthen neutral conductor. In this connection Rule 32(1) of Indian Electricity Rules 1956 (See Appendix 'A') shall also be referred.

### **13. Switch Board & Distribution Boards:**

Metal clad switchgear shall preferably be mounted on any of the following types of Board.

#### **Hinged type Metal Boards:**

These shall consist of a box made of sheet metal not less than 2mm thick and shall be provided with a hinged cover to enable the board to swing open for examination of the wiring at the back. The joints shall be welded, a teak wood board, thoroughly protected both inside and outside with good insulating varnish shellac, for General purpose, and of not less than 6.5mm thickness shall be provided at the back for attachment of incoming and outgoing cables. There shall be a clear distance of not less than 2.5 cm. between the teak wood board and the cover, the distance being increased for larger boards in order that on closing of the cover, the insulation of the cables is not subjected to damage and no short length of cables is subjected to excessive twisting or bending in any case. The board shall be securely fixed to the wall by means of rag bolts, plugs or wooden Gutties and shall be provided with a locking arrangement and an earthing stud. All wires passing through the metal board shall be bunched. Alternatively hinged type metal boards shall be made of sheet covering mounted on channel or angle iron frame.

**Note:** Such type of boards are particularly suitable for small switch boards for mounting metal clad switchgear connected to supply at low voltages.

#### **13.2 Fixed type Metal Boards:**

These shall consist of an angle or channel of iron frame fixed on the wall or floor and supported on the wall at the top at if necessary. There shall be a clear distance of one meter in front of the switch board. If there are attachments of base connections at the switch board Rules 51(1) (c) of Indian Electricity Rules, 1956 shall apply.

**Note:** Such type of boards are particularly suitable for large switchboard for mounting large number of switch gears or higher capacity metal clad switch gear or both.

#### **13.3 Teakwood Boards:**

For small installations connected to a Single phase 230 volts supply teak wood boards may be used as main boards or sub-board. These shall be of seasoned teak or other durable wood with solid back impregnated with varnish of approved quality with all joints dovetailed.

13.4 In large size medium voltage installations before proceeding with the actual construction of the boards, a proper drawing showing the detailed dimensions and design including the disposition of the mountings, which shall be

symmetrically and neatly arranged for arriving at the over-all dimensions, shall be prepared and approved by the Professor in-charge Electrical System-in-charge.

### 13.5 Recessing of Boards:

Where so specified the switchboards shall be recessed in the wall. The front shall be fitted with a hinged panel of teak wood or other suitable material, such as bakelite, or with unbreakable glass doors in teak wood frame with locking arrangement, the other surface of the doors being flush with the walls. Ample room shall be provided at the back for connection and at the front between the switchgear mountings.

### 13.6 Arrangement of Apparatus:

- a. Equipment which is on the front of a switchboard shall be so arranged that inadvertently personal contact with live parts is unlikely during the manipulation of switches, changing of fuses or like operation.
- b. No apparatus shall project beyond any edge of panel. No fuse body shall be mounted within 2.5cm. of any edge of the panel and no hole other than holes by means of which the panel is fixed shall be drilled closer than 1.3 cms. from any edge of the panel.
- c. The various live parts, unless they are effectively screened by substantial barriers of non-hygroscopic non-inflammable insulating material shall be so spaced that an arc cannot maintain between such parts and earth.
- d. The arrangement of the gear shall be such that they shall be readily accessible and their connections to all instruments and apparatus shall also be easily traceable.
- e. In every case in which switches and fuses are fitted on the same pole, these fuses shall be so arranged that the fuses are not alive when their respective switches are in the 'OFF' position.
- f. No fuses other fuses instrument circuit shall be fixed on the back of or behind a switchboard pannel or frame.

### 13.7 Marking of Apparatus:

- a. Where a board is connected to voltage higher than 250 volts, all the apparatus mounted cont it shall be marked in the following colours to indicate the different poles or phases to which the apparatus or its different terminals may have been connected.

#### **Alternating Current**

Three phases red,  
Yellow, & blue,  
Neutral black

#### **Direct Current**

Three wire system-2 outer wires,  
positive red & negative blue  
Neutral black

Where fuse wire three phase wiring is done, the neutral shall be in one colour and the other three wires in another colour.

- b. Where a board has more than one switch each such switch shall be marked to indicate which section of the installation it controls.
- c. All markings required under the rule shall be clear and permanent.

### **13.8 Main & Branch Distribution Board:**

13.8.1 Main and branch distribution boards shall be of any type mentioned in 13.1.

13.8.2 Main distribution board shall be provided with a switch or air circuit breaker on each pole of each circuit, a fuse on the phase or live conductor and a like on the neutral or earthed conductor of each circuit. The switches shall always be linked.

13.8.3 Branch Distribution Board:

13.8.3.1 Branch distribution boards shall be provided with a fuse or a miniature circuit breaker or both of adequate rating/setting chosen on the live conductor of each circuit and the earthed neutral conductor shall be connected to a common like and be capable of being disconnected individually for testing purposes. At least one spare circuit of the same capacity shall be provided on each branch distribution board.

13.8.3.2 In residential installations lights and fans may be wired on a common circuit, such subcircuit shall not have more than total of ten points of lights, fans and socket outlets. The load of such circuit shall be restricted to 800 watts. If a separate fan circuit is provided, the number of fans in the circuit shall not exceed ten. Power sub circuits shall be designed according to the load but in no case shall there be more than two outlets on each sub circuits.

13.8.3.3 In Industrial and other similar installations requiring the use of group control of switching operation circuits, for socket outlets may be kept separate from fans and lights, normally fans and lights may be wired on a common circuit however, if need is felt separate circuits may be provided for the two. The load on any low voltage sub circuit shall not exceed 3000 Watts. In case of new installation, all circuits and sub circuits shall be designed by making provision of 20 percent increase in load due to any future modifications power sub circuits shall be designed according to the load but in no case shall there be more than four outlets to each sub circuits.

### **13.9 Installation of Distribution Boards:**

13.9.1 The distribution fuse-boards shall be located as near as possible to the centre of the load they are intended to control.

13.9.2 These shall be fixed on suitable stanchion or wall and shall be accessible for replacement of fuses.

13.9.3 These shall be either metal clad type or all insulated type. But, if exposed to weather or damp situations, type shall be of the weather proof type and, if installed where exposed to explosive dust, vapour or gas, they shall be of flame proof type.

13.9.4 Where two or more distribution fuse boards feeding low voltage these distribution boards shall be:

1. Fixed not less than 2m apart; or
2. Arranged so that it is not possible to open two at a time namely, they are interlocked and the metal case is marked 'Danger 415 Volts', or
3. Installed in a room or enclosure accessible to only authorized persons.

13.9.5 All distribution boards shall be marked 'Lighting', 'Power', as the case may be and also marked with the voltage and number of phases of the supply. Each shall be provided with a circuit list giving details of each circuit which controls and the current rating of the circuit and size of fuse element.

**13.9.6** Triplo pole distribution boards shall not be generally used for final circuit distribution unless specific approval of Professor in-charge Electrical System in charges obtained. In special cases where use of Triple pole distribution boards is inevitable they shall be of HRC fuse type only.

### **13.10 Wiring and Distribution Board**

13.10.1 In wiring a branch board, total load of the consuming devices shall be divided, as far as possible, evenly between the board, leaving the spare circuit for future extension.

13.10.2 All connections between pieces of apparatus or between apparatus and terminals on a board shall be neatly arranged in a definite sequence following the arrangements of the apparatus mounted thereon, avoiding unnecessary crossings.

13.10.3 Cables shall be connected to a terminal only by soldered or welded or crimped lugs using suitable sleeve, lugs or ferrules unless the terminal is of such a form that it is possible to securely clamp them without the cutting away of cable stands.

13.10.4 All bare conductors shall be rigidly fixed in such a manner that a clearance of at least 2.5cms. is maintained between conductors or opposite polarity or phase and between the conductors and any material other than insulating material.

13.10.5 If required a pilot lamp shall be fixed and connected through on independent single pole switch and fuse to the bus bars of the board.

13.10.6 In a hinged type board, the incoming and outgoing cables shall be fixed at one or more points according to the number of cables on the back of the board leaving suitable space in between cables, and shall also, if possible be fixed at the corresponding points on the switch board panel. The cables between these points shall be arranged to form a 'U' or 'S' shaped loop which shall be of such length as to allow switchboard panel to swing through an angle of not less than 90.

### **14.0 Capacity of Circuits:**

14.1 Lights and fans may be issued on a common circuits and such a circuit shall not have more than a total of ten points of lights, fan and socket



outlets or a load of 800 watts whichever is less. The power circuits shall be designed with a maximum of two outlets per circuit generally when load is not known or specified. In non-residential buildings at important District centers however one outlet per circuit may be preferred. The circuit shall be designed based on the loading of the circuit where not specified, the load shall be taken as 1 KW per outlet. Where the load is more than 1 KW it should be controlled by an isolator switch or miniature circuit breaker.

#### **15.0 Passing Through Walls and Floors:**

15.1 Where conductors pass through walls one of the following methods shall be employed. Care shall be taken to see that wires pass very freely through protective pipe or box and that the wires pass through in a straight line without any twist or cross in wires, on either ends of such holes.

(a) A teak wood box extending through the whole thickness of the wall shall be buried in the wall and casing or conductors shall be carried so as to allow 1.3cms air space on three sides, of the casing conductor.

(b) The conductor shall be carried either in a rigid steel conduit conforming to \*IS: 1653-1964 specification for Rigid Steel conduits of Electrical wiring (Revised) or a rigid non-metallic conduit conforming to \*IS : 2509-1963 specification for Rigid Non-Metallic conduits for Electrical Installation, or in a porcelain tube of such size which permits easy drawing in. The end of conduit shall be neatly bushed with porcelain, wood or other approved material.

(c) Insulated conductors while passing through floors shall be protected from mechanical injury by means of rigid steel conduit (See \*IS: 1653-1964) to a height not less than 1.5 m above the floors and flush with the ceiling below. This steel conduit shall be earthed and securely bushed.

15.2 Where a wall tube passes outside a building so as to be exposed to weather, the outer end shall be mounted and turned down-wards, and properly bushed on the open end.

#### **16.0 Fixing to Walls and Ceilings:**

Plugs for ordinary walls or ceilings shall be of well seasoned teak or other approved hardwood not less than 5 cm long and 2.5 cm. square on the inner end and 2 cm. square on the outer end. They shall be cemented into walls to within 7.5 mm of the surface, the remaining being finished according to the nature of the surface with plaster or lime punning.

16.1 Where owing to irregular crossing or other reasons the plugging of the walls or ceiling with wood plugs presents difficulties, the wood casing, wood batten, metal conduit, or cleat (as the case may be) shall be attached so the wall or ceiling in an approved manner. In the case of new buildings, wherever possible, teak wood plugs shall be fixed in the walls before they are plastered.

16.2 To achieve neatness, plugging of walls or ceiling may be done by an approved type of asbestos, metallic or a fiber fixing plug.

### 17.0 Branch Switches:

Where the supply is derived from a three-wire or four-wire source, and distribution is done on the two wire system, all branch switches shall be placed in the outer or live conductor of the circuit and no single-phase switch or fuse shall be inserted in the middle wire, earth or earthed neutral conductor of the circuit. Single-pole switches (Other than for multiple control) Carrying not more than 15 amperes may be of tumbler type which shall be ON when the handle knobs are down.

### 18.0 Fittings:

Where conductors are required be threaded through tubes or channels formed in the metal work of fitting these must be free from sharp angles or projecting edges and such size that will enable them to be wired with the conductors used for the final sub circuits without removing the braiding, taping or outer covering. As far as possible all tubes and channels should be of sufficient size to permit 'Looping back' of wires cables and flexible cords, other than those designed for high temperature shall not be used for wiring fittings except for portable fittings. All fittings must have not less than a half inch male nipple. Fittings and lamp holders for gas filled lamps shall be adequately ventilated.

18.1 Where lighting fitting is supported by one or more flexible cords, the maximum weight to which the twin flexible cords may be subjected shall be as follows:

Nominal cross sectional area of twin flexible cord. (mm <sup>2</sup> )	No. & Dia in mm of wires	Max. Permissible weight (Kg.)
0.50	16/0.2	1.70
0.75	24/0.2	2.60
1.00	32/0.2	3.5
1.50	48/0.2	5.30
2.50	80/0.2	8.80
4.00	128/0.2	14.0

18.2 No inflammable shade shall form a part of light fitting unless such shade is well protected against all risks of fire. Celluloid shade or light fitting shall not be used under any circumstances.

18.3 Fitting of Wire:

The use of fittings wire shall be restricted to the internal wiring and the lighting fittings. Where fittings wire is used for wiring fittings, the sub-circuit loads shall be terminating in a ceiling zone or connector from which they shall be carried into the fittings.

### 19.0 Lamp Holders:

Lamp holders for use on brackets and the like shall be in accordance with \*IS: 1258-1967 specification for Boyonet lamp holders and all those for use with flexible pendants shall be provided with cord grips. All lamp holders shall be provided with shade carriers. Where center contact edison screw lamp

holders are used, the outer or screw contacts shall be connected to the middle wire, the neutral, the earthed conductor of the circuit.

## **20.0 Outdoor Lamps:**

External and road lamps shall have weather proof fittings of approved design so as to effectively prevent the admission of moisture. An insulating distance piece of moisture proof materials shall be inserted and the fittings. Flexible cord and cord grip lampholders shall not be used where exposed to weather. In verandahs and similar exposed situation where pendants are used, they shall be of fixed rod type.

## **21.0 Lamps:**

All incandescent lamps, unless otherwise required and suitably protected, shall be hung at a height of not less than 2.5 m above the floor level. They shall be in accordance with IS: 418-1957 specification for Tungsten Filament General Service electric lamps.

## **22.0 Fans, Regulators and Clamps:**

### **22.1.0 Ceiling fans:**

Ceiling fans including their suspension shall conform to \*IS: 374-1960 specification for electric ceiling fans regulators (Revised) & to the following requirements :

All ceiling fans shall be wired to ceiling roses or to special connector boxes, to which fan rod wires shall be connected and suspended from hooks or shackles with insulators between hooks and suspension rods. There shall be no joint in the suspension rod, but if joints be avoidable then such joints shall be screwed to special couplers of 5 cm minimum length and both ends of pipes shall touch together within couplers, and shall in addition be secured by means of split pins, alternatively, the two pipes may be welded.

(a) Fan clamps shall be of suitable design according to the nature of construction of ceiling on which these clamps are fitted. In all cases fan clamps shall be fabricated from tested new metal of suitable sizes and they shall be as close fitting as possible. Fan clamps for reinforced concrete roofs shall be buried with the casting and due care shall be taken that they shall serve the purpose. Fan clamps for wood beams shall be of suitable flat iron fixed on two sides of the beam and according to the size and section of the beam one or two mild steel bolts passing through the beam shall hold both flat irons together. Fan clamps for steel joint shall be fabricated from tested flat irons to fit rigidly to the bottom flange of the beam. Care shall be taken during fabrication that the metal does not crack while hammering to shape. Other fan clamps shall be made to suit the position, but in all cases shall be taken to see those trays are rigid and safe.

**NOTE:** All fan clamps shall be so fabricated that fans revolve steadily.

(b) Canopies on top and bottom of suspension rod shall effectively hide suspensions and connections to fan motors, respectively.

(c) The lead-in-wire shall be of nominal cross-sectional area not less than 1.0 mm<sup>2</sup> with copper and 1.5 mm<sup>2</sup> with aluminum and shall be protected from abrasion.

(d) Unless otherwise specified, the clear distance between the ceiling fan and the floor shall be not less than 2.75 m.

#### **22.2.0 Exhaust Fans:**

For fixing of an exhaust fan, a circular hole shall be provided in the wall to suit the size of the frame which shall be fixed by means of rag-bolts embedded in the wall. The hole shall be neatly plastered with cement and brought to the original finish of the wall. The exhaust fan shall be connected to exhaust fan point which shall be wired as near to the hole as possible by means of a flexible cord, care being taken that the blades rotate in the proper direction.

#### **23.0 Attachment of Fittings and Accessories:**

23.1.0 In other than conduit wiring, all ceiling crosses brackets, pendants and accessories attached to walls or ceiling shall be mounted on substantial teak wood blocks twice varnished after all fixing holes are made in them. Blocks shall be not less than 4 cms. deep brass screws only shall be used for attaching fittings and accessories to their base blocks.

#### **24.0 Interchangeability:**

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

#### **25.0 Conduit Wiring System:**

25.1.1 Type and size of conduit – All conduit pipes shall be conforming to \*IS: 1653 – 1964, furnished with galvanized or stove enameled surface. All conduit accessories shall be of threaded type and under no circumstances pin grip type or clamp type accessories be used. No steel conduit less than 16 mm in diameter shall be used. The number of insulated conductors that can be drawn into rigid steel conduit are given in Table II.

25.1.2 Bunching of cables – unless otherwise specified, insulated conductors of AC supply and DC supply shall be bunched in separate conduits.

25.1.3 Conduit-Joints-Conduit pipes shall be joined by means of screwed couplers and screwed accessories only (See \*IS 2667-1964) specification for fittings for Rigid Steel Conduits for Electrical Wiring). In long distance straight runs

of conduit, inspection type couplers at reasonable intervals shall be provided or running threads with couplers and jam-puts (in the latter case the bare threaded portion shall be treated with anti-corrosive preservative) shall be provided. Thread on conduit pipes in all cases shall be between 11 mm to 27 mm long sufficient to accommodate pipes to full threaded portion of couplers or accessories. Cut ends of conduit pipes shall have no sharp edges nor any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes.

TABLE-II MAXIMUM PERMISSIBLE NUMBER OF 250-V GRADE SINGLE-CORE CABLES THAT CAN BE DRAWN INTO RIGID STEEL CONDUIT (CLAUSE 6.5.1.1)

Size of cable Nominal Cross sectional area	Number and Diameter in mm of wires	Size of conduit (mm)													
		16		20		25		32		40		50		63	
		(No. of cables, Max)													
		S	B	S	B	S	B	S	B	S	B	S	B	S	B
1.0	1/1.12	5	4	7	5	13	10	20	14	-	-	-	-	-	-
1.5	1/1.40	4	3	7	5	12	10	20	14	-	-	-	-	-	-
2.5	(1/1.80)	3	2	6	5	10	8	18	12	-	-	-	-	-	-
4.0	(1/2.24)	3	2	4	3	7	6	12	10	-	-	-	-	-	-
	(3/1.06*)														
	(7/0.85*)														
6.0	(1/2.80)	2	-	3	2	6	5	10	8	-	-	-	-	-	-
	(7/1.06*)														
10.0	1/3.55+	-	-	2	-	5	4	8	7	-	-	-	-	-	-
	(7/1.40*)	-	-	2	-	4	3	6	5	8	6	-	-	-	-
16.0	(7/1.70)	-	-	-	-	2	-	4	3	7	6	-	-	-	-
25.0	(7/2.24)	-	-	-	-	-	-	3	2	5	4	7	6	9	7
35.0	(7/2.50)	-	-	-	-	-	-	2	-	4	3	7	5	8	6
50.0	7/3.00+	-	-	-	-	-	-	-	-	2	-	5	4	6	5
	(19/1.80)	-	-	-	-	-	-	-	-	2	-	5	4	6	5

\* For Cu. Conductors only.

+ For Al. Conductors only.

**NOTE : 1** The table shows the maximum capacity of conduits for the simultaneous drawing-in of cables. The table applies to 250 volt grade cables. The columns headed 'S' apply to runs of conduit which have distance not exceeding 4.25 M between draw-in boxes, and which do not deflee from the straight by angle of more than 15°. The columns headed 'B' apply to runs of conduit which deflect from the straight by an angle of more than 15°.

**NOTE : 2** In case an inspection type draw-in box has been provided and if the cables is first drawn through one straight conduit, then through the drawn box, and then through the second straight conduit, such systems may be considered as that of a straight conduit even if the conduit defects through the straight by more than 15°.

25.1.4 Protection against dampness – In order to minimize condensation or sweating inside the tube, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects as far as possible.

- 25.1.5 Protection of conduit against rust – The outer surface of the conduit pipes, including all bends, unions, tees junction boxes etc. forming part of the conduit system shall be adequately protected against rust particularly when such system is exposed to weather. In all cases, no bare threaded portion of conduit pipe shall be allowed. Unless such bare threaded portion is treated with anti-corrosive preservative or covered with approved plastic compound.
- 25.1.6 Fixing of conduit – Conduit pipes shall be fixed by heavy gauge saddles, secured to suitable wood plugs or any other approved plug with screws in an approved manner at an interval of not more than one metre but on either side of couplers or bends or similar fittings, saddles shall be fixed at a distance of 30 cm. from the center of such fittings.
- 25.1.7 Bends in conduit – All necessary bends in the system including diversion shall be done by bending pipes; or by inserting suitable solid or inspection type normal bends, elbows or similar fittings; or by fixing cast iron inspection boxes whichever is more suitable conduit fitting shall be avoided as far as possible on conduit system exposed to weather; where necessary, solid type fittings shall be used. Radius of such bends in conduit pipes shall be not less than 7.5 cm. No length of conduit shall have more than the equivalent of four quarter bends from outlet to outlet, the bends at the outlets not being counted.
- 25.1.8 Outlets – All outlets for fittings, switches etc., shall be boxes, of suitable metal or any other approved outlet boxes for other surface mounting or flush mounting system.
- 25.1.9 Conductors – All conductors used in conduits wiring shall preferably be stranded. No single-core cable of nominal Cross – Sectional area greater than 130 mm<sup>2</sup> shall be enclosed alone in a conduit and used for alternating current.
- 25.1.10 Erection and earthing of conduit – The conduit 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 & permanently connected to earth conforming to the requirements specific under 7 by means of special approved type earthing clamp efficiently fastened to conduit pipe in a workmanlike manner for a perfect continuity between each wire and conduit. Gas or water pipes shall not be used as earth medium. If conduit pipes are liable to mechanical damage they shall be adequately protected.
- 25.2 Recessed conduit wiring system with Rigid Steel conduits – Recessed conduit wiring system shall comply with all the requirement for surface conduit wiring system specified in 6.5.1.1 to 6.5.1.10 and in addition, conform to the requirements specified in 6.5.2.1 to 6.5.2.4.
- 25.2.1 Making of chase – The chase in the shall be neatly made and be of ample dimensions to permit the conduit to be fixed in the manner desired. In the case of buildings under constructions, chases shall be provided in the wall, ceiling, ect. at the time of their construction and shall be filled up neatly after erection of conduit and brought to the original finish of the wall.

- 25.2.2 Fixing of conduit in chase – The conduit pipe shall be fixed by means of staples or by means of saddles not more than 60 cm. apart. Fixing or standard bends or elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe if self with a long radius which will permit easy drawing in of conductors. All threaded joints of rigid steel conduit shall be treated with some approved preservative compound to secure protection against rust.
- 25.2.3 Inspection boxes – Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires, if necessary. These shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection box covers.
- 25.2.4 Types of accessories to be used – All outlets such as switches and wall sockets may be either of flush mounting type or surface mounting type.
- a. Flush mounting type – All flush mounting outlets shall be of cast iron or mild steel boxes with a cover of approved insulating material or shall be a box made of a suitable insulating material. The switches and other outlets shall be mounted on such boxes as would be approved. The metal box shall be efficiently earthed with conduit by an approved means of earth attachment.
  - b. Surface mounting type – If surface mounting type outlet box specified, it shall be of any approved insulating material and outlet mounted in an approved manner.
- 25.2.5 When crossing through expansion joints in buildings, the conduit sections across the join may be through flexible conduits of the same size as the rigid conduit.

25.3 Conduit Wiring System with Rigid Non-Metallic Conduits :

Rigid Non-Metallic conduits are used for surface, recessed and concealed conduit wiring

25.3.1 Type and size – All non metallic conduits used shall conform to IS : 2509-1963. The conduit may be either threaded type or plain type as specified in IS : 2509-6913\* and shall be used with the corresponding accessories (See IS : 3419-1965) specification for Fittings for Rigid Non-Metallic Conduits).

25.3.2 Bunching of cables - Conductors of AC supply and DC supply shall be bunched in separate conduits. The number of insulated cables that may be drawn into the conduits are given in Table III. In this table the space factor does not exceed 40 percent.

TABLE –III MAXIMUM PERMISSIBLE NUMBER OF 250 VOLTS GRADE SINGLE CORE CABLES THAT MAY BE DRAWN INTO RIGID NON METALLIC CONDUITS

Size of cables	No. &	Size of conduits (mm)
----------------	-------	-----------------------

Nominal cross-sectional area mm <sup>2</sup>	Diameter in mm of wires.	(Number of cables, Max.)					
		16	20	25	32	40	50
1.0	1/1. 12*	5	7	13	20	--	--
1.5	1/1. 40	4	6	10	14	--	--
2.5	1/1. 80	3	5	10	14	--	--
	3/1 06*						
4	1/2 . 24	2	3	6	10	14	--
	7/2. 85*						
6	1/2. 80	--	2	5	8	11	--
	7/1. 06*						
10	1/3. 55+	--	--	4	7	9	--
	7/1. 40*						
16	7/1. 70	--	--	2	4	5	12
25	7/2. 24	--	--	--	2	2	6
35	7/2. 50	--	--	--	--	2	5
50	7/3. 00+	--	--	--	--	2	3
	19/1. 80						

\* For copper conductors only.

+ For aluminum conductors only.

25.3.3 Conduit joints – shall be joined by means of screwed or plain couplers depending on weather the conduits are screwed or plain. Where there are long runs of straight conduit, inspection type couplers shall be provided at intervals. For conduit fittings and accessories reference may be made to IS : 3419-1965.

25.3.4 Fixing of conduits – The provision of 25.1.6 shall supply except that the spacing between saddles or supports is recommended to be 60 cms for rigid non metallic conduits.

25.3.5 Bends in conduit – Wherever necessary, bends or diversions may be achieved by bending the conduits (See 6.5.3.9) or by employing normal bends, inspection bends, inspection boxes, elbows or similar fittings.

25.3.6 Conduit fittings shall be avoided, as possible, on outdoor system.

25.3.7 Outlets – All the outlets for fittings switches, etc. shall be boxes of substantial construction. In order to minimise condensation or sweating inside the conduit, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects, etc. as far as possible.

25.3.8 For use with recessed conduit wiring system the provisions of 6.5.2.1 to 6.5.2.4 shall apply.

25.3.9 Heat may be used to soften the conduit for bending and forming joiits in case of plain conduits. As the material softens when



heated fitting of conduit in close proximity to hot surfaces should be avoided. Caution should be exercised in the use of the conduit in locations where the ambient temperature is 50°C or above. Use of such conduits in places where ambient temperature is 60°C or above is prohibited.

## **PVC INSULATED AND P.V.C. SHEATHED OR T.R.S. WIRING SYSTEM**

### **26.0 GENERAL :**

This system of wiring is suitable for low pressure installation, and shall not be used in places exposed to sun and rain nor in damp places, provided they are sheathed in the special approved protective covering and well protected to withstand dampness.

#### **26.1 Attachment to walls and ceiling**

26.1.1 All cables on brick walls stone or plastered walls and ceiling shall be run on well seasoned, perfectly straight and well varnished on four sides, tack wood or any approved hardwood battens not less than 10mm finished thick; width of which shall be such as to suit total width of cables laid on the batten. Prior to erection, these shall be painted with one coat of varnish or approved paint of colour to match with surrounding. These battens shall be secured to wall and ceilings by flat head wood screws to rawl plug or phill plug at an interval not exceeding 75 cm. Wood plugs can be used only with special approval of the Professor in-charge Electrical System-in-charge. The flat head wood screws shall be within wood batten and smoothed down with file.

26.1.2 Where wiring is to be carried out along the face of the rolled steel joints, a wooden batten of adequate width shall first be laid on the same and dipped to it as inconspicuously as possible. The wiring should then be fixed to this backing in the ordinary way where wiring passes through structural steel work, the holes shall be suitably bushed to prevent the abrasion of the cables.

26.1.3 Attachment to false ceiling : In no case, the open wiring shall be run above the false ceiling without the approval of Professor in-charge Electrical System in-charge.

26.2 Link clips : Only aluminium alloy clips/joint clips shall be used. The thickness shall be 0.32 mm (30 SWG) for lengths of 25mm to 40 mm and 0.40mm (28 SWG) for lengths of 50mm to 80 mm. The width shall not be less than 8 mm in all these cases. Link clips/joint clips shall be so arranged that one single clip shall not hold more than two twin core or three single core TRS or PVC insulated and PVC sheathed upto 2.5 Sq.mm above which a single clip shall hold a single twin core or two single core cables. The clips shall be fixed on varnished wood battens with iron pins spaced at interval of 15 cm both in the case of horizontal and vertical runs.

26.3 Bends in wiring : The wiring shall not in any circumstances be bent so as to form an abrupt right angle but must be rounded off at the corners to a radius not less than six times the overall diameter of the cable.

26.4 Protection of wiring from Mechanical Damage :

- 26.4.1 In cases where there are chances of any damage to the wiring such wiring shall be drawn complying with all the requirements of conduit wiring system.
- 26.4.2 Such protective covering shall in all cases be fitted on all down drops within 1.5m from the floor or from floor level upto the switch board whichever is less.
- 26.5 Passing through floors : All cables taken through floor shall be enclosed in heavy steel conduit extending 1.5m above the floor or upto the switch board whichever is less and flush with the ceiling below or by means of any approved type of metallic covering. The ends of all conduits or pipes shall be neatly bushed with porcelain wood or other approved material. The conduit pipes, wherever accessible, shall be securely earthed.
- 26.6 Passing through walls : When conductors pass through walls, any one of the following methods shall be employed. Care should be taken to see that wires pass very freely through protective pipe or box and that wires pass through in a straight line without any twist or cross in wires, on either ends of such holes.
- a. A box of teak wood or approved hard wood extending through the hole thickness of the wall shall be buried in the wall and casings or conductors shall be buried in the wall and casings or conductors shall be carried so as to allow 1.3 cm air space on the three sides of the casing or conductor.
  - b. The conductors shall be carried in an approved heavy gauge solid drawn or lap weld conduit or in a porcelain tube of such a size that it permits easy drawing in the ends of conduit shall be neatly bushed with porcelain wood or other approved material.
- 26.6.1 Where a wall tube passes outside a building so as to be exposed to weather, the outer end shall be bell mouthed and turned downwards and properly bushed on the open end. The conduit shall be neatly arranged so that the cables enter them without bending.
- 26.7 Buried cables : The TRS or PVC sheathed cable shall not normally be buried directly in plaster. Where so specified in the special specification they may be taken in teak wood channeling of ample capacity or conduit pipe buried in the wall.
- 26.8 Stripping of outer covering : While cutting and stripping of the outer covering of the cable, care shall be taken that the sharp edge of the cutting instrument does not touch the inner insulation of the conductors. The protective outer covering of the cables shall be stripped off near connecting terminal and this protective covering shall be maintained upto the close proximity of connecting terminals as far as practicable. Care shall be taken to avoid hammering on link clips with any metal instrument, after the cables are laid. Where junction boxes are provided they shall be made moisture proof with a plastic compound.
- 27. PAINTING WORK IN GENERAL :**
- 27.1 Paints : Paints, oils, varnishes, etc. of approved make in original tin to the satisfaction of the Professor in-charge Electrical System –in-charge shall only be used.

- 27.2 Preparation of surface : The surface shall be thoroughly cleaned and dusted before painting is started. The proposed surface shall be inspected by Professor in-charge Electrical System – in – charge or his authorised agent and shall have received the approval before painting is commenced.
- 27.3 Application Paint shall be applied with brush. The paint shall be spread as smooth & even as possible particular care shall be paid to rivets, nuts, bolts and cover lapping. Before drawing cut, it shall be continuously stirred in the smaller containers with a smooth stick while it is being applied.
- Each coat shall be allowed to dry out sufficiently before a subsequent coat is applied
- 27.4 Scope : Painting on old surface in indoor situations will not include primer coat except where specially mentioned in the schedule of work or special specification. However, where rust has formed on iron and steel surfaces the spots will be painted with one anti-rust primer coat.
- 27.5 Precautions : All furniture fixtures, glazing floors etc. shall be protected by covering. All stains, smears, splashings, dropping of every kind shall be removed. While painting of wiring etc. it shall be ensured that paintings of wall and ceiling etc. is not spoiled in any way.
- 27.6 Painting of conduit and accessories : After installation, all accessible surface of conduit pipes, fittings switch and regulator boxes etc. shall be painted with two coats of approved enamel paint or aluminium paint as required to match the finish or surrounding wall, trusser etc.
- 27.7 Link clips :
- The clips for batten wiring shall be of Aluminium conforming to I.S. specification No 2415 1975.

## **SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT - 7.**

### **APPENDIX – A**

Important clauses of Indian Electricity Rules 1956 Following clauses of Indian Electricity Rules, 1956 shall in particular be taken care of in the execution of electrical works.

<b>Clause</b>	<b>Subject</b>
3.	Authorization.
29.	Construction, installation, protection, operation and maintenance of electric supply lines and apparatus.
31.	Cut-out on consumer's premises.
32.	Identification of earthed and earthed neutral conductors and position of switches and cutouts therein.
33.	Earthed terminal on consumer's premises.
36.	Handling of electric supply lines and apparatus.
41.	Distinction of circuits of different voltages.
42.	Accidental charge.
43.	Provisions applicable to protective equipment.
44.	Instructions for restoration of persons suffering from electric shock.
45.	Precautions to be adopted by consumers, owners, electrical contractor, electrical wiremen and suppliers.
46.	Periodical inspection and testing of consumer's installation.
48.	Precautions against leakage before connection.
50.	Supply to consumers.
51.	Provisions applicable to medium, high voltage installations.
58.	Point of commencement of supply.
59.	Precautions against failures of supply; Notice of failures.
61.	Connection with earth, (Low and Medium Voltage systems.)
64.	Use of energy at high and extra-high voltage.
67.	Connection with earth. (High & Extra –high voltage systems.)
68.	General conditions as to transformation and control of energy.

All clauses under Chapter VIII on Overhead Lines.

137.	Mode of entry.
138.	Penalty for breaking seal.
139.	Penalty for breach of rule 45.
140.	Penalty for breach of rule 82.
141.	Penalty for breach of ruels.

**SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT - 7.  
APPENDIX – B**

**Form of Completion Certificate**

I/We certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief, it complies with Indian Electricity Rules, 1956, as well as the C.P.W.D. General specification for Electrical Works 1972.

ELECTRICAL INSTALLATION AT : \_\_\_\_\_  
VOLTAGE AND SYSTEM OF SUPPLY : \_\_\_\_\_

**1. PARTICULARS OF WORKS :**

**A. Internal Electrical Installation :**

Detail	No.	Total Load	Type/system of wiring
1. Light Point 2. Fan Point 3. Bell Point 4. Plug Point a. 5 Amp. b. 15 Amp.			

**B. Others :**

Description	HP/KW	Type
Motors 1. 2.		
Other 1. 2.		
Plants 3.		

**C. Over Head Line/Under Ground cable :**

Type & Des. of O/H line _____	_____
Length _____ and _____	_____ span
No. & Des. of St. Lt. _____	_____
Length & Size of Cable _____	_____ mts.
_____ mm <sup>2</sup>	_____
No. of Joints, _____	End _____ Tee _____
St.Jt. _____	_____

**2. EARTHING :**

Description of earthing electrode: \_\_\_\_\_  
No. of \_\_\_\_\_ electrodes \_\_\_\_\_ :  
\_\_\_\_\_ Size of main earth  
lead : \_\_\_\_\_

**3. TEST RESULTS :**

- a. Insulation Resistance :
- Whole System of conductors to earth \_\_\_\_\_  
Megohms.
  - Between phase & neutral.      R & N \_\_\_\_\_ Megohms.  
  Y & N \_\_\_\_\_ Megohms.  
  B & N \_\_\_\_\_ Megohms.

iii. Between phase to phase . R & Y \_\_\_\_\_ Megohms.  
 Y & B \_\_\_\_\_ Megohms.  
 B & R \_\_\_\_\_ Megohms.

b. Polarity Test :  
 Polarity of non linked single pole branch switches \_\_\_\_\_

c. Earth Continuity Test :  
 Maximum resistance between any point in the earth continuity conductor including metal conduits & main earthing lead \_\_\_\_\_ ohms.

d. Earth Electrode Resistance :  
 Resistance of electrode 1. \_\_\_\_\_ ohms.  
 2. \_\_\_\_\_ ohms.  
 3. \_\_\_\_\_ ohms.

e. Lighting Protective System :  
 Resistance of the whole lighting protective system to earth before bonding is effected with electrode and metal in/on the structure \_\_\_\_\_ ohms.

Signature of Supervisor

Signature of Supervisor

\_\_\_\_\_  
 Name : \_\_\_\_\_  
 Address : \_\_\_\_\_  
 : \_\_\_\_\_

\_\_\_\_\_  
 Name : \_\_\_\_\_  
 Address: \_\_\_\_\_  
 : \_\_\_\_\_

Permit No : \_\_\_\_\_

License No : \_\_\_\_\_

**SPECIFICATIONS**

All specification, standard, publication etc. specified mean the “latest standards” publication etc. pertaining to Electrical Installation and should conform to the following wherever applicable.

1. Indian Electricity Act 1910 with its amendments.
2. Indian Electricity Rules 1956 and its amendments.
3. Indian Electricity supply act 1948.
4. Regulation for Electrical Equipment in building by IEE.
5. The factory act 1948 and its amendments.
6. IS 732, 1982 Part –I, II & III Code of Practice for Electrical Wiring and Fittings in Buildings for Low and Medium voltages not exceeding 1100 volts.
7. IS 4064, 1967 H.D. Air break switches and fuses for voltages not exceeding 1100 volts.
8. IS 3043 – Earthing code of practice.
9. IS 1554, 1970, Part-I, PVC insulated (Heavy duty) Electric cables FOR WORKING VOLTAGES UPTO AND INCLUDING 1100 VOLTS.
10. IS 694, 1964 Part – II – PVC insulated cable with Aluminum conductors for voltages upto 1100 volts.
11. IS 5908, 1970 – Electrical installations in buildings, Method of measurements.
12. IS 4237, 1967 – General requirement for switchgear and controlgear for voltage not exceeding 1000 volts.
13. IS 1653, 1964 – Rigid Steel conduits for electrical wiring.
14. IS 2509, 1973 – Rigid Non-metallic conduits for electrical installation.
15. IS 1258, 1967 – Beyonet Lampholders.
16. IS 418, 1957 – Tungston Filament General Service Electric Lamps
17. IS 374, 1966 – Fans and Regulators, Ceiling Type.
18. IS 2667, 1964 – Fitting for rigid steel conduits for electrical wiring.
19. IS 3419, 1976 – Fitting for rigid non-metallic conduits.
20. National Electric Code 1989.

**SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT - 7  
ANNEXURE – I**

Abstract of the Wiring Rules of the Institution of Electrical Engineers.

(Referred to the Specification)

Definitions (See Clause 2 Specification)

**SYSTEMS:** An electrical system is which in all the conductor and apparatus are electrically connected to a common source of supply.

1. earthed: Effectually connected to the general mass of the earth. "Solidly earthed" means earthed without the intervention of a fuse, switch, circuit breaker, resistor, reactor or solenoid.
2. Uninsulated Connector: A conductor without provision, by the interposition of a dielectric of otherwise, for its insulation from earth.
3. Bare: Not covered with insulating material.
4. Dielectric: Any material which offers high resistance to the passage of an electric current.
5. Bunch Conductor: When more than one conductor is contained within a single duct or groove or when they are run enclosed and not spaced apart from each other.
6. Points: In wiring, as per IS 5908, 1970 – Method of Measurements of Electrical Installation in Buildings.
7. Switch Board: An assemblage of switchgear with or without instruments, but the term does not apply to a group of local switches in a final sub circuit where each switch has its own insulating base.

**NOTE:** In the electricity (Factories Act) special regulations 1908 and 1944, the term "Switchboard" includes "Distribution board".

8. Single Pole Switch: A switch suitable for closing and/or opening a circuit on one phase or pole only.
9. Linked Switches: A switch, the blades of which are so linked mechanically as to make or break all poles simultaneously or in a definite sequence.
10. Fuse Switch: A switch, the moving part of which carries one or more fuses.
11. Three Wire System:
  - a. Outer Conductor:  
Those between which there is the greatest difference of potential. This use of the word outer must not be confused with the use of the word when applied to the external conductor of a concentric main.
  - b. Neutral Conductors:  
The term includes the neutral conductor of 3-phase 4-wire system, the conductor of a single-phase or d.c. installation which is earthed by the supply undertaking (or otherwise at the source of the supply) and the middle wire or common return conductor of a 3 wire d.c. or single phase a.c. system.
12. Semi enclosed machine : One in which the ventilating openings in the frame are covered with.



- a. Grids, expanded metal or with gauge, with openings of less than  $\frac{1}{4}$  inch so as to abstract free ventilation;
  - b. Wire gauge, in which the openings are less than  $\frac{1}{4}$  inch but not less than  $\frac{3}{32}$  inch (diameter or width):
  - c. Screens with smaller openings than the above.
13. Totally Enclosed Machine : One is which the enclosing case and bearing are dust proof and which does not allow circulation of air between the inside and outside of the case.
14. Pipe Ventilated Machine : An enclosed machine in which the frame is so arranged that the ventilating air may be conveyed to it through a pipe attached to the frame, the ventilation opening maintained by the fanning action protected by the machine itself.
15. Forced Drought Machine : An enclosed machine in which the ventilating air supply is maintained by an independent fan external to the machine itself.
16. Protected Machine : One having end shield bearing and in which there is free access to the interior without opening doors or removing covers.
17. Switches and Circuit Breakers :
- Switches and circuit breakers (rules 2b, 36 and 37) whether fixed separately or combined with lamps, holders or fittings, must comply with the following requirements.
- a. Overheating must not take place at the point of contact or elsewhere, when the full current flows continuously.
  - b. They must be so constructed or arranged that the contractors cannot accidentally close when left open.
  - c. The bases must be of incombustible, nonconducting and moisture proof material
  - d. Circuit breakers must be so arranged and placed that no combustible material is endangered by their action.
  - e. Unless placed in an engine room or in a compartment especially arranged for the purpose, they must have their live parts covered. The covers must be of incombustible material and must be either non-conducting or of rigid metal and clear of all internal mechanism. For more than 6 amperes, at pressure exceeding 125 Volts metal covers must be lined with insulating material.
  - f. In positions where they are liable to injury or to come into contact with goods, they must be further protected by an open fronted box or other suitable guard.
  - g. Handles must be insulated and so arranged that the hand cannot touch live metal, or injured through and adjacent fuse blowing.
  - h. Switches having a handle projecting through an open slot in the cover, must not be used.

**Signature of Contractor**

**DIRECTOR  
SVNIT, Surat**

**SECTION F – 1A**  
**GENERAL REQUIREMENTS**

**1.1 Scope of Works :**

The work covered by electrical specification consists supplying and installing, electrical wiring system complete in strict accordance with this specification and the applicable drawings and subject to the terms and conditions of the contract. It includes.

- a. Conduit and wiring system for fans, lighting points, bells, clocks, sockets etc. including fixing of lighting fixtures and fans etc. and miscellaneous points.
- b. Conduit and wiring system for exhaust fans, power sockets etc.
- c. Panel boards, distribution boards, switch fuse units.
- d. Complete power and lighting cable systems.
- e. Grounding system.
- f. Conduits for telephone system.
- g. Street lighting system.
- h. Other miscellaneous electrical work.

**1.1 Completeness of Contract :**

Any work fitting, accessories or apparatus which may not have been specifically mentioned in the specification but which are necessary in the equipment for efficient working of the plant should be deemed to be include in the contract and should be executed and provided by the contractors. All plant and apparatus should be complete in all the details, whether such details, are mentioned in the specifications or not.

Three prints and one permanent negative of each of the finally approved drawings incorporating all the modifications proposed by the Institute should be submitted. No modifications should be made in a drawing already approved by the Professor in-charge Electrical System-in-charge without his prior consent.

Approval of the contractor's drawings will not relieve the contractor of any part of his obligation to meet all the requirements of the contract.

**1.2 Guarantee :**

The performance of all the equipment and the installation should be guaranteed at least for a minimum period of one year from the date of taking over the installation by the Institute. All equipment must comply with the relevant IS – BS specifications.

**1.3 Interchangeability :**

All corresponding parts of similar plant and equipment should be interchangeable in every way.

**1.4 Tools :**

All special tools required for dismantling and assembly of the equipment covered by the contract shall be supplied included in the contract. A list of items to be supplied by the Contractor should be submitted alongwith the tender.

## **SECTION F 2-A**

### Specifications for Electrical Installation in Building

#### **1. GENERAL :**

- 1.1 These specifications relate to the electrical installations in the buildings of Institute Electrical. The specifications cover general equipment to be fulfilled. These general specifications are supplemented by the specifications for the particular buildings separately attached.
- 1.2 These specifications are governed by the General conditions of the contract attached hereto.
- 1.3 **APPLICABLE RULES AND REGULATIONS :**
  - 1.3.1 Installation shall be carried out in conformity with the regulations for electrical equipments of buildings, published by the Institute of Electrical Engineers, London, (14 Edition 1966 and as amended upto date) herein after referred to as the IEE wiring regulations. Where these specifications or the special specifications for the particular building attached hereto are at variance with the IEE regulations these specifications or special specifications as the case may be, shall be followed. The installation shall also comply with the requirement of the Indian Electricity Act 1910 as amended upto date and rules issued there under and also the regulations for the Electrical Equipment of Buildings issued by the Bombay Regional Council of Engineers Associated of India. Where not specified otherwise, the installation should generally follow the Indian Standard Codes of Practice and in their absence the relevant British Standard of practice. All the materials shall comply with the relevant Indian Standard of British Standard specifications.
- 1.4 **Definitions :**
  - 1.4.1 The definitions of terms in the IEE regulations shall apply in general,
- 1.5 **Drawings :**
  - 1.5.1 The preliminary drawings only indicate the general scheme of requirements. The extra position of all point, control switch boxes, runs of wiring and/or conduits joint boxes, and inspection boxes, mains, and subdistribution boards, mains, etc. shall be got approved by the Professor in-charge Electrical System-incharge. All circuits shall be clearly numbered in wiring diagrams and building plans. The detailed design of a switch-board, special fixture or any other part of the electrical installation as may be called for by the Professor in-charge Electrical System-incharge shall also be supplied by the Contractor and should be got approved by the Professor in-

charge Electrical System-incharge. Three sets of completion drawings and wiring diagrams showing the installations as executed shall be supplied by the contractor alongwith the completion certificate.

## 1.6 MATERIALS

All materials shall be new and of the best quality conforming to the relevant IS/BS specifications. They must be the products of reliable manufacturers of many years or standing. All like parts of materials shall be interchangeable. In case of equipment such as circuit breakers, switch fuses etc. a descriptive and illustrated literature shall accompany the tender. The names of manufacturers of various materials shall be furnished in Performa in Appendix – I. Samples of materials wherever required should be approved by the Professor in-charge Electrical System-incharge before use in the installation. One set of such approved samples shall be deposited with the Professor in-charge Electrical System-incharge. All materials shall be rust-proof or rendered rust proof by application of suitable paints. The supply of all equipments, switchgears etc. shall be complete with accessories, fittings and mountings as may be required for their proper performance, and as specified in the relevant IS/BS Code of practice and standards.

## 1.7 WORKMANSHIP :

1.7.1 Good workmanship and neat finished appearance are the prerequisites for complying with the clauses of these specifications. With a view to ensure fine workmanship the tenderers shall employ licensed wiremen, with an experience of not less than 5 years in the type of work they are engaged. The work should be done under the supervision of licensed Electrical Supervisors with good educational qualifications and considerable their experience.

1.7.2 Tenderer shall furnish the names of Supervisor and their wiremen who will be engaged in this work with details of their experience.

## 1.8 CO-OPERATION WITH CIVIL AND OTHER WORKS CONTRACTOR :

1.8.1. The tendered, after the award of the contract, shall co-operate with the civil and other contractors and shall co-ordinate his work with the work with the work of other contractors with the least amount of dislocation and interference to the other works. Tenderers shall go through the drawings carefully and shall furnish the Prof-incharge with all the details of openings in the walls etc. they may be required for concealing any of the electrical equipments or accessories. Where the contractor fails to furnish such information as may be required for the purpose of concealing the equipments etc. they shall be made at his (contractor) cost and expense. Any alteration to parts of the building shall be carried out with prior permission of the

competent authority. All chasis structural work shall be made good at the contractor's expense and brought to the original shape finish and colour.

1.9 TESTING :

The electrical contractor shall be completely responsible for the testing and commissioning of those installations covered by the specifications in compliance with the standard procedure, in obtaining permission of the Government Electrical Inspector. Any modification which is demanded by Government Electrical Inspector shall have to be carried out within the scope of the contract. The contractor shall be provided by the contractor for carrying out the installation work. All tests shall be carried out in the presence of the Professor in-charge Electrical System or in his authorized representative and his approval obtained for the test results.

1.10 COMPLETION CERTIFICATE AND MAINTENANCE GUARANTEE :

1.10.1 After the completion of the installation and testing, the contractor should furnish a certificate in the Proforma in Appendix – III, at the time of taking over the installation by the Institute. The installation shall be guaranteed for period of 12 months from the date of taking over by the Institute. During the period of guarantee all defects in material or in workmanship shall be rectified or replaced free of cost to the Department.

1.11 TENDERER'S ABILITY

1.11.1 In order to enable the Institute to assess the ability of the tenderer to execute the work, the tenderer shall furnish evidence of his experience and capacity to carry out the work of the magnitude and nature.

1.12 RATES :

1.12.1 The rates of items shall include all taxes, transport loading and unloading charges and all such charges that may be required to be incurred for the supply and installation of the materials at site. The rates shall be firm and variations in the market are not entertained. Break up figures as required in the schedule of work shall also be furnished. As far as possible indigenous materials only shall be included for supply. Where it is unavoidable, imported items may be included and tenderer should clearly indicate materials, quantity, rate and amount of these items.

1.13 STORAGE SPACE :

No covered storage space will be provided by the Institute. The contractor has to make his own arrangement. However, the Institute may give an open space near the place of executing the works.

1.14 DEPARTURE FROM SPECIFICATIONS :

The tenderer should clearly indicate departure, if any from the specifications with reasons for the same.

1.15 EXTRA ITEMS :

Rates for extra items shall generally be derived from the rates already available in the schedule. Where it is not possible the rates shall be mutually agreed upon and the contractor shall furnish a detailed analysis of the rates claimed by him.

**2. TECHNICAL SPECIFICATIONS :**

2.1 Supply System :

The wiring installation shall be suitable for 3-phase, 4-wire, 400/440V, 50 Hz system of supply. Colour code of different phase shall be followed as per standard.

2.2 Wiring for Lights and Fans :

2.2.1 Looping system of wiring shall be adopted. No joints shall be made at intermediate runs of cables and where they are unavoidable such joints shall be through approved mechanical connections.

2.2.2 Point Wiring :

Point wiring shall consist of the branch wiring from the switch board together with the controlling switch or push as far as and including the ceiling rose or any other approved connector or socket, outlets. In case of more than one light being controlled by one switch, the wiring upto the ceiling rose of the first light including the switch shall be considered as a 'Primary' point, Loop wiring from light to light shall be considered as a 'Secondary' point and rates shall be quoted separately including final connections to fixtures and plugs.

2.2.3 Conductor :

No conductor for final sub-circuit wiring for light and socket outlets shall have across-section less than that of 2.5 sq. m. (aluminum) or equivalent copper)

2.2.4 Loading :

No final sub-circuit radiating from the fuse board of a sub-distribution board and wired with 2.5 sq. m. (Aluminium)/ equivalent copper cable shall carry more than 10 lights, fans or socket outlets or a connected load of 800 watts whichever is greater. The following wattages may be assumed for estimating the load on each sub-circuit unless otherwise known or specified.

Incandescent Lamps	100 watts
Ceiling fans	60 watts
5-A Socket Outlets (Lighting)	100 watts
120 cm. Fluorescent tube	50 watts
150 cm. Fluorescent tube	100 watts

In each sub-distribution board at least one way preferably two ways shall be left spare for future requirement. A wiring diagram giving the detail or the extra utilization of the ways shall be prepared and fixed in the sub-distribution board itself or any other easily accessible place. The ways of sub-distribution boards shall be accordingly numbered.

#### 2.2.5 Local Control Switches (General)

Local control switches for circuits carrying not less than 5-A shall be piano type and shall conform to relevant IS Stds. The switch shall be 'ON' when the knob is in the down position. All local control switches shall be connected in the phase or live conductor only and not in the neutral conductor, switches shall be fixed in iron clad box and shall be so placed that the center of the switch box is 1.3 mtr. From the finished floor level unless otherwise stated. All switch boxes shall be provided with 1/8" thick prepex cover fixed to the switch box with chromium plated counter sunk screws (brass).

##### 2.2.5A Switches (Two Way)

- a. Two way switches shall be piano type single pole, double throw; 250 V, suitable for flush mounting and of 5A capacity as per the drawings. All switches shall be recessed in a embedded metal box.
- b. Each box shall have suitable outlet for fixing conduits directly.
- c. Each box shall have prepex cover painted inside with the wall colour if required.
- d. Each switch shall be suitable for the position in a corridor stairway wiring.

##### 2.2.5B Switch Boxes (General) :

Electrical circuits shall be written suitably on the cover of all switch boxes, as approved by the Professor in-charge Electrical System (Elect.) whenever different phase are terminated in a switch box bakelite partition shall be provided. Each case shall be provided with a GI earth stud nut and washers for earth connectors.

#### 2.2.6 Ceiling Rose :

Ceiling rose shall be used on circuits having a voltage normally exceeding 200V. Only one flexible cord shall be attached to a ceiling rose. Only 3-pin 5A socket outlet shall be provided in lighting circuits. All socket outlets shall be provided with a control switch and they shall be mounted in switch boxes in an approved manner.

#### 2.2.7 Fittings :

These shall be of approved type as specified in the tender schedule. The sub-circuits leads should terminated in a ceiling rose or conductor in the fitting and internal connection made there from. Wherever these



fittings are suspended they shall be done so through the conduits and ball and socket joints. All fittings shall be grounded by a GI conductor not less than 16 SWG.

2.2.8 Flexible Wiring :

Flexible cords of not less than 23/0076 size shall be used. The weight of suspension shall be governed by IEE Regulations.

2.2.9 Ceiling Fans :

All ceiling fans shall be wired to ceiling rose and suspended from a hook shackle or clamp and insulated from the same. All joints in the suspension rod shall be screwed and secured by means of split pins.

The fan clamps supplied by the Contractor shall be suitable for the ceiling or roof member as the case may be. For concrete roofs, fan books shall be buried in concrete during construction in an approved manner and securely bound to the reinforcement.

2.2.10 Conduits and Earthing :

All conduits feeding lighting and fan circuits shall be provided with earth continuity GI conductor as specified for power wiring. All conduits shall be as specified for power wiring.

**2.3** 2.3.1 Point Wiring :

Point wiring for power shall be defined under section 2.2.2 and shall include the switches and sockets.

2.3.2 Loading :

All distribution boards for power wiring shall be not less than 15A per way. Loading way shall not exceed normally 1000 watts. The following loads may be assumed if exact figures are not known.

3-Pin	15A Outlets	1000 Watts
3-Pin	5A Outlets	100 Watts

2.3.3 Wiring for Motors :

2.3.3.1 Final sub-circuits loop in motors shall be connected to separate ways of the Distribution Board even if the current in the sub-circuit is less than 15A. No looping is permissible.

2.3.3.2 All wiring shall be carried in HG conduit as specified in IS specification for gauge of different sizes of conduits. Where the motor is resiliently mounted flexible conduit with approved adopters shall be used for the last few feet. Where cables are used sufficient loop shall be left.

2.3.3.3 All switch fuse units, controlling circuits feeding motors shall be provided with HRC fuses or as specified.

2.3.3.4 The frame of every motor and its associated control gear shall be earthed by two separate and distinct connections to earth. Connector shall be capable of carrying 3 times the rating of fuse

or 1.½” time presetting of the circuit breakers but in no case less than No. 8 SWG or 7.064” or equivalent cross section of copper, where practicable. The earth connections shall be visible for periodical inspection. Gas or water pipes shall not be used for earth connections.

#### 2.3.3.5 Socket Outlets and Control Switches 5A and 15A :

All socket outlets shall be of 3 pin type, the third pin being connected to the earth stud of the nearest distribution board by separate earthing wire. The socket shall conform to IS 1293, 1978, single pole, piano type. Each socket outlets shall be provided with a control switch of appropriate rating and as specified. The switch and socket shall be mounted inside the iron clad box provided with 1/8” prepex cover as directed by the Professor in-charge Electrical System or as in schedule of quantities. Inside switch box ample space shall be available around switched for connecting wires to switches. All socket outlets for power shall be mounted at the skirting level unless otherwise specified or as directed by the Professor in-charge Electrical System.

The three phase plug receptacles shall have their earth terminals connected by independent earth wires to ring main earth strips on the building. In buildings where explosion proof fixtures are installed single-phase plug receptacles as well as light points shall be connected to ring main ground bus installed in the building by separate earth wires of approved size.

Socket outlet shall have some provisions not to receive the matching plug unless the grounding pin is in correct position. The grounding pin of the plug shall make the contact first and break the contact last at the time of inserting or removing the plug respectively.

The grounding terminal shall be connected to the enclosed metal body by providing GI stud, nut washers welded to the box.

Each unit shall be suitable for flush mounting as required and indicated in the applicable drawings.

Combination unit of socket outlet and switch shall be complete with necessary internal wiring. The switch/socket shall be mounted on MS bracket enclosed in a box.

## 2.4 Conduit Wiring :

2.4.1 Where conduit wiring is adopted the type and size of the conduit shall be as indicated in the drawings. The minimum size of the conduit shall be 19 mm.

2.4.2 The contractor shall thoroughly study the structural and architectural arrangements in the buildings and wherever necessary shall in consultation with Institute representatives at site make suitable adjustments in the cable routings, earthing arrangements and location boxes, fittings etc. with a view to avoid interference with any part of the

building, structure, equipment or any other work in the building or to effect any improvement in the arrangement.

#### 2.4.3 Protection of Conduit Against Rust :

Conduit shall be given two coats of oxide paint before they are placed in position. All exposed conduit shall be painted after installation with the colour as approved by the Professor in-charge Electrical System. This does not apply to galvanized conduit.

#### 2.4.3A Protection Against Insects and Damp :

In order to minimise condensation or sweating inside, the conduit system shall be properly drained and ventilated and in such a manner as to prevent the entry of insects.

2.4.4 Conduit shall first be installed as a complete system without cables and shall be continuous from outlet to outlet from fitting to fitting and mechanically and electrically connected to all boxes and fittings.

### 2.5 SPECIFICATION FOR POWER CONTROL AND TELEPHONE CABLES:

#### I SCOPE:

1. The specifications cover the supply and installation of medium, voltage, power and cables either in ground or in trench depending on the conditions at site including accessories for the same. The work in general, consists of supplying, laying, joining, terminating and connecting all, 1.1 KV APLSTS PVC power and control cables.
2. The contractor shall supply all accessories including jointing and terminating materials, compound, tapes, supporting materials, cleats, cable lugs, concrete slabs, bricks, sand, cable markers etc. as required to make the installation work including digging and backfilling of the trenches as required.

#### II SPECIFICATIONS:

1. All power cables to be supplied mentioned as 'APLSTS' in the schedule should be mass impregnated, non-draining, paper insulated lead sheathed. Double steel tape armoured and must comply with the latest IS/BS specifications.
2. All cabling material such as cable compound, cable lugs, tapes, shall be of approved quality acceptable to the type recommended by the manufacturer of the cable for which it is used and approved by the Institute.
3. Installation of all equipments shall also conform to the applicable codes and practices as per the IS and shall be executed to comply with the latest Indian Electricity Rules as regards the safety, earthing of equipments and other essential provisions specified therein.
4. Only approved make of cables shall be used. ICC and CCI will be preferred.
5. The cables shall generally be laid as per IS code of practice.

#### III GENERAL RULES FOR CABLE LAYING:

1. Installation shall be carried out in a neat, workman like manner by skilled experienced and competent workmen in accordance with the standard practice.
2. Cable shall be laid preferably in one-piece length to avoid joints, if straight joints are found necessary these can be introduced with prior approval of the Professor in-charge Electrical System. The cost of the straight joint however, shall not be borne by the Institute. But in no case joint shall be within the conduit, G.I. pipe and duct.
3. Proper care should be exercised in handling the cable to avoid formation of band etc. and should it become necessary a cable shall be bent to a radius not less than 20 times the overall diameter of the cable.
4. Method of installation, routing of cable etc. shall in every case be subject to the Institute approval and the contractor shall modify and/or certify at no extra cost to the Institute any portions of the installation which do not meet with the Institute approval. All damages to the civil and other works on this account shall be made good by the contractor at no extra cost to the Institute.

The electrical contractor while notifying the building contractor for such work shall furnish the proper drawings, fully explaining the work involved or indicate at site actual work to be carried out as may be required by the building contractor. The electrical contractor shall also notify to the building contractor in writing for finishing up as required any such work as soon as the electrical work with respect to the same has been completed.

5. Where cables pass through hume pipes, contractor shall fix hard wood bushed round the cables at the end of the hume pipes. Where the cables pass through the floors or chambers and in such other situations as the Engineer shall requires, the contractor shall seal cable holes in a manner approved by Professor in-charge Electrical System. Where cable pass through roads, nallahs, etc. cables must be protected by Class 'A' Hume pipe of diameter not less than 6" (15 cms) should be used.
6. The cable route shall be the shortest and there shall be minimum interference with built up areas, lawns etc.
7. Care shall be exercised for providing suitable probs for supporting other service lines on earth at the time or excavation. Where cutting of a lawn become inevitable it should be with the approval of the Professor in-charge Electrical System.
8. Excavation of the trenches shall be executed with verticals sides and the trenches shall be kept as straight as possible. The exact location of each trench shall be settled by the Professor in-charge Electrical System. On the site when the contractor is in a position to commence each portion of the work.

The trench shall be not less than ½ meter wide and 90 cms. deep. If more cables are to be laid, the width should be suitably increased.

9. After the cables are laid; the trench shall be filled in layers, the earth in each layer being well rammed by spraying water and consolidated and sufficient allowance made for settlement. The extra earth over the trench

should be removed from the place of trench to a place as decided by the Professor in-charge Electrical System at site.

10. Ends of cables shall be properly sealed to prevent entry of moisture proof to installation.
11. Where it is as specified as ½ core in multi core cables, the ½ core shall be a neutral conductor having reduced section.
12. For all multicore cable, each core and tails shall be brought out marked and or coloured in on approved manner.
13. Cable termination shall be done with suitable compression brass glands in the case of PVC cables and cast iron trifurcating boxes in the case of APLSTS cables. The armour should be connected to the ring main earth in building with duplicate earth wires as per the relevant IS/BS specifications.

The core insulation over each conductor shall however be retained through out the run of the conductor upto the end where lugs shall be fitted thereon for connections. The lugs shall be fitted by means of approved solder and flux such as Aleap and Eyre No. 7 liberally used. The joint shall be mechanically strong and pressure tested.

## **2.6 DISTRIBUTION BOARDS AND PANELS:**

### **General Requirements:**

All distribution panels shall comply with IEE Rules 60-61. A clear distance of 0.916 meter in front of the switchboard shall be kept. Where bare connections or attachments are provided at the back of the switch board, the space behind the panel shall be either less than 0.299 meter or more than 0.762 m width there shall be a passage way from the furthest outstanding part of any attachment or conductor. If the space behind the switch board exceed 0.762 m width, there shall be a passage way from either end of the switch board clear to height of 1.928 m width 0.299 m. All wiring connection shall be made neatly and securely.

For conductors carrying more than 10 Amps, tinned cable sockets shall be used. All connections shall be so made as to form their own diagram; Circuit shall be clearly numbered to correspond to wiring diagram. Names of the distribution boards shall be painted as directed by the Professor in-charge Electrical System. All the switch fuse units and isolators, D. Bs shall be complete with earthing studs, lugs, neutral bar link, HRC fuses and of approved make.

Skeleton type panels shall have a rigid form work adequately braced and supported. The switch and distribution boards shall be neatly arranged in the frame. The details of the frame work and the arrangement of switches shall be got approved by the Professor in-charge Electrical System before the panel is fabricated.

All cubical type panels shall have rigid supporting frames adequately branches over which sheet metal shall be neatly secured. All switches, distribution boards etc. shall be neatly arrangement on the panels and all connections made from the back of the switches. The panels shall be rendered dust and vermin proof. The interior of the panels shall not be accessible to unauthorized persons.

The recess type boards shall be embedded in wall in a cupboard with a metal hinged door with locking arrangement. In all recessed conduit work, all distribution boards shall be recessed. Where recessing is not possible free

standing panel may be provided as approved by the Professor in-charge Electrical System.

All individual components i.e. switch fuse units, D. Bs. etc. shall be connected by earth continuity wire of appropriate size with the main earth bus of the panel, D. Bs etc. The panel switches or D. Bs shall be earthed by not less than 2 distinctive paths to earth. Earthing of metallic parts or exposed metal shall be effected through any structural metal work which houses the installation. Where metallic parts are not required to be earthed and are liable to become alive, should the installation of the contractor become defective, such metallic parts shall be separated by durable non-conducting material from any structural work.

- a. Power panels shall be 3-phase, 4-wire. 400/230 V for the distribution of 3-phase or single-phase power loads. Lighting panels shall be 3-phase, 4-wire 400/230 V for single-phase lighting load distribution on all three phases.
- b. All panels shall be done or protected front type with no mechanical or electrical defects.
- c. Bus bars shall be of electrolytic copper or aluminum as specified and the properly tinned sizes as indicated on applicable drawings as required.
- d. All knock outs for branch circuits, conduit entries shall be drilled and filled as required. For lighting panels, the top and bottom cover plates shall be removable type.
- e. Main disconnect device for all panel boards shall be of switches of disconnect type and of the size as indicated. It shall be mounted directly below the panel or through a short threaded conduit of required size.
- f. The main disconnect for all panels boards shall have an entry suitable for PVC armoured cable from the bottom.
- g. All panel boards shall be provided with an earthing terminal and lugs for connection to the grounding system.
- h. Temperature rise of all electrical parts shall not be more than 30° C with full load ambient at room temperature.
- i. Buses shall be securely supported so that ordinary vibrations will not cause any of the parts to become loose.
- j. All barriers and supports of current carrying parts shall be of moisture resistant insulating material and shall not be adversely affected by arcing.
- k. The locations of panels shown in the drawings are only tentative, panels may be located at a place approved by the Professor in-charge Electrical System.
- l. All civil works connected with fixing such as grouting chasing and making good shall be the tenderers responsibility.
- m. Wires of adequate capacity with proper size of lugs shall be used for interconnections.

- n. Panel should be self supported on angle channel iron frame work. It should be preferably of bolted construction in case of transportation and flexibility. The frame shall be of the required size for the mounting of the equipment on it. It shall be bolted or grouted rigidly after leveling and alignment.
- o. The cupboard and D.B. should be of such size so as to be accommodated in the existing room as per IE rules and IS codes of practice for installations of Medium Voltage switch gear.
- p. Fabrication drawing showing the detailed dimensions and panels and its components indicating the frame work, earthing positioning of switches, D. Bs, cable boxes, adopter chambers etc. shall be furnished to the Professor in-charge Electrical System for his approval. All materials to be got approved by the Professor in-charge Electrical System. Panel should be guaranteed for satisfactory operations for a period of one year after handling over.
- q. The panel should have painted with anticorrosive paint suitable for humid and salty atmosphere with two of primer.

Switch Gears, Power Panels D.B. and S.F.U.s.

2.6.7 The main bus bar shall have continuous current ratings as specified with neutral bar having half of full load rating of the phase bus bar. The sizes of the bus bar shall be so selected that the current density in bar does not exceed 150 amps. per sq.cm. for copper. The length of bus-bar chamber should be as suitable length to fix all the switches etc. as per the prevailing standards, clear spacing of two adjacent busses shall be 1.½” minimum. Bars should be taped all along with colour coated 11KV grade PVC tape. The maximum internal of support for each unsupported length shall exceed 600 mm.

The bus bar shall be of copper/aluminum and fabricated to the relevant standards specification. In case aluminium bus bar is used special with high conductivity aluminum bus bar alloy E91C, frame conforming to IS 2898 shall be used. The current density shall not exceed 800A sq. inch. Hylam barriers will be provided over the joints to prevent any short circuit.

The bus bar enclosing shall be made out of not less than 16 gauge MS sheet constructed on with angle Iron support. All interconnections between bus bar S & F units and DBs shall be of adequate size and details of such interconnection shall be furnished to the Professor in-charge Electrical System for his approval.

The bus bar shall be air insulated extensible type rectangular one. The bus bar chamber shall be dust tight by providing gaskets secured properly so as to render it vermin proof.

The Combination Fuse-switch unit should comply with IS 4064, BS 861 and BS 2510 wherever applicable. it should be suitable to accommodate High Rupturing Capacity cartridge Fuselinks complying with IS 2208 or BS 88 and having a certified rupturing capacity of not less than 35 MVA at 440 Volts (AC 5 duty). The switch gear (Panels,

DBs etc.) shall be installed generally as per IS 3072, Part-I and as specified and shown in drawings.

All fuse switch units shall be provided with non-deteriorating HRC fuse links complying with IS 2208-1962 and having rupturing capacity of 35 MVA at 415 Volts or as specified.

All switches above 60 amps rating shall be provided with suitable size adapter boxes. All switches mounted on the top of the bus bars shall be provided with detachable type reverse entry adapter boxes. Suitably engraved labels shall be provided for each circuit as well as for the board.

A meters with selector switches and LMH meter shall be provided where specifically for small wiring for the interconnection shall be colour coded and provided with numbered ferules for easy identification of circuits.

- a. The distribution boards should be totally enclosed, metal clad complying with BS 214. The MS sheet steel enclosures for recessed DBs shall be of not less than 14 gauge.
- b. The DB shall be with hinged door and the locking arrangements as approved by the Professor in-charge Electrical System.
- c. All the components shall be enclosed in the enclosure. The mounting of DBs shall be got approved by the Professor in-charge Electrical System before carrying out the installation.
- d. The DBs shall have proper size cut out for conduits entry or cable entry as required and these shall be made on site.
- e. Adequate spacing shall be provided inside the D. Bs. for easy removal of the fuses and carry out the interconnection.
- f. A set of insulating barriers have to be provided between incoming breakers, switches and fuses.

Switches Units:

- a. All the DP and TPN switch fuse units shall be totally enclosed tron clad quick make, quick break type of best Indian make conforming to the IS or BS 3185 specifications. All the switch fuse units shall have mechanical interlock with a door, so that the door cannot be opened when the switches are in 'ON' position. The switches should be of double break isolation type of ensure safety.
- b. Each DP and TPN switch fuse unit shall be earthed with two distinct earth connections.
- c. Suitable insulator, separators shall be provided between phases.
- d. There shall be suitable neutral link in the fuse box.
- e. All DP and TPN switch fuse units shall be rated for 500 volts and DP (required for single phase supply) and SPN switches for 250 volts.
- f. The HRC cartridge fuse shall conform to IS 88, 1952.



The OCBs, ACB shall be suitable for 400/440 volts 3-phase 50 Hz supply capable of interrupting a fault MVA of not less than 31. The circuit breaker shall conform to the BS 936, 1940 and BS 3659 with such tripping arrangement as may be required under special specifications for the building. Efficient and fool-proof mechanical interlocking shall be provided for the safe operation and maintenance. The rate shall be inclusive of the first filling of oil.

## 2.7 INSTRUMENTATION:

The instruments and meters wherever necessary shall be housed in special sheet box located between switch fuse units and bus bar chambers. The instruments etc. shall be mounted on the hinged cover with their dial flushed. All instruments shall have protective HRC fuse links. All interconnections and small wiring shall be neatly dressed arranged and duly coloured for easy identification or circuits.

Meters shall be provided as required in the Schedule. Meter shall be dead head and be suitable for 400/440 volt 3-phase 4-wire 50 Hz (in balanced load) supply.

Each selector switch shall be 3 points and of minimum 250 volts grade with silver tipped contacts suitable for metering circuits. Current Transformer shall be of 5 VA burden and commercial metering accuracy. Indicating lamps shall be panel mounting type preferably of 250 V grade. Every unit shall be rewired and interconnected to the system for its required indicating performance. Indicating lamps shall have independent circuit fuses.

## 2.8 FIXING OF LIGHTING FIXTURES:

1. Location of fixtures, their manner of fixing, mounting height etc. are indicated in relevant drawings. Actual location and levels shall however be arrived at site in co-ordination with other services etc. Prior approval of the Professor in-charge Electrical System regarding the actual location, manner of fixing shall be obtained before the work is taken up in hand.
2. In all cases the contractor shall provide necessary interconnection, wiring, earthing painting etc. all necessary for complete installation. The contractor shall also test and commission the fixtures during completion of the work.
3. General arrangement of fixture layout is indicated in drawings, care shall be taken to see that all light fixtures are in a row in a room or particular area are in absolute line and plumb and are symmetrically disposed with respect to finished surface of walls, columns, beams etc.
4. The interconnections wiring from the light outlet point upto the fixture shall be carried out by means of flexible copper wire of section not less than 1.5 sq. mm.
5. All fixtures suspended by means of conduits shall be down with ball and socket joints or as per approved design.

## 2.9 TELEPHONE SYSTEM:

1. Empty conduits shall be done, recessed or exposed to surface along with pull boxes, junction boxes and telephone outlet boxes, in areas and locations as indicated in the relevant drawings as per materials and methods as described in regard to conduits under section "Wiring in Conduits" except the GI pull wires of gauge not less than 20 SWG shall be kept pulled through conduits in all sections so that in future telephone wires can be pulled easily.
2. Location shown on the drawings are approximate and final location shall be decided in the field by the Professor in-charge Electrical System.

**Signature of Contractor**

**DIRECTOR  
SVNIT, Surat**

**SECTION - G  
SPECIFICATION FOR EARTHING**

**1. Installation of Earthing Plates:**

All installation of earthing shall conform to Indian Electricity Rules, IS 3043 and IEE. The copper earth plates should be tinned before installation. The earth plates of copper 60 cm x 60 cm x 3.151 mm thick size as mentioned in the schedule should be in separate pits atleast 150 cms to 300 cms. away from the building at a depth necessary to reach moist earth surface but with a minimum depth of 2.5 meter from the finished ground level upto the top vertical dodge of earth electrode. The earth plate shall be thoroughly cleaned to remove all dirt from the surface and be tinned properly for electrical contact with the main ground. Each earthing pit should be provided with 38 mm. dia. G.I. pipe 2.5 ms. long or more depending upon the depth of pit, put over the vertical edge of earth plate (with top end of pipe provided with a closed top coupler). Alternative layers of salt and coke shall be provided surrounding the plate. The pits shall be filled when the plates are in position and with the approval of Professor in-charge Electrical System.

To facility watering the pit, a concrete compartment should be made with funnel with mesh and cover plate as per rules provided in ISI regulations. The masonry enclosures shall be 25 x 25 x 25 cms with Cast Iron lid of 23 x 30 cms size. After installation the earthing resistance of each earth plate should be measured by resistance magger in the presence of Professor in-charge Electrical System, three days after the completion of earthing work and the value should conform to regulations.

**Signature of Contractor**

**Director  
SVNIT, Surat**

## **H. DECLARATION FORM**

1. I/We hereby declare that I/We have visited the site and fully acquainted myself / ourselves with the local situation regarding materials, labour and other factors pertaining to the work before submitting this tender.
2. I/We hereby declare that I/We have carefully studied the conditions of contract, specifications and other tender documents of this work and agree to execute the same accordingly.

SIGNATURE OF THE CONTRACTOR:

ADDRESS:

DATE:

PLACE:

**DIRECTOR  
SVNIT, Surat**