NOTICE INVITING TENDER

1.1 GENERAL

Indraprastha College invites Tender in prescribed Performa on Limited Tender basis from the shortlisted agencies out of Pre-Qualification process, for the following work.

Name of work	**:** Repair work at Canteen Roof shed at Indraprastha College for Women, University of Delhi.
Earnest Money Deposit (EMD)	**:** NIL
Period of completion	**:** 1 month
Estimated Cost	**:** Rs.4,92,089/-
Last date for submission of Tender	**:** 29 October 2021

1.2 POINTS TO BE NOTED

1.2.1 Works envisaged under this contract are required to be completed in all respects within the period of completion mentioned above.

1.2.2 The mere fact that the tenderer has been short-listed for the work shall not imply that his tender shall automatically be accepted. The same should contain all technical details as required for the consideration of tender.

1.2.3 Tender document consists of following sections:

i) Notice Inviting tender
ii) Form of Tender
iii) Article of Agreement
iv) Instructions to Tenderer
v) General Conditions of Contract
vi) Special Conditions for Cement and Steel
vii) Testing of Material
viii) General Condition of Contract

Bid forms and other details can be obtained from the http://eprocure.gov.in/eprocure/app or www.ipcollege.ac.in free of cost. For more clarification you may visit on above website and contact on e-tender helpdesk No.011-47008184

1.2.4 The contract shall be governed by the documents listed in Para 1.2.3 above.

1.2.5 Conditional offer or offer with deviations from the Conditions of Contract or other requirements stipulated in this tender document is likely to be rejected as non-responsive.

1.2.6 The I.P. College reserves the right to accept or reject the tender offer without assigning any reasons. Tenderer shall not have any cause of action or claim against the I.P. College for rejection of his proposal.

Principal
Indraprastha College for Women

SECTION – II

FORM OF TENDER

To,
……..,
……..,
……..,
……..,

Dear Sir,

Subject: C/o Indraprastha college

I/We have read and examined the notice inviting tender, Form of Tender, Article of Agreement, Instructions to Tenderer, General Conditions of Contract, Special Conditions for Cement and Steel and Tenderer Financial Offer, Testing of Materials & Brief specifications, Drawings and other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified as above within the time specified viz. schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred in the General Rules, Directions and in Clauses of the Conditions of Contract.

I/We do hereby agree that this amount shall not bear any interest and shall be forfeited by you in the event of your tender is accepted and if I/We fail to execute the contract agreement or to commence the works at site when called upon to do so.

Dated.....
Name of ----------
Witness: -..... **

Address: -.....

Occupation: -.....

Signature of Contractor.....

Postal Address: -.....

Telephone No.

Fax:-

E-Mail:-

**

ii)

Dated.....
Name ----------
Address: - ..... * *
Occupation: -.....

**** To be filled in by the Contractor.**

BOQ

Name of work:- Repairing of Canteen Roof Shed						
S.No.	DSR 2018	Item	Qty	Unit	Rate	Amount
1	MR	Providing and fixing of polycarbonate sheet 8mm thick malti wall to be fixed by help of stainless steel scrows with EPDM seal, complete upto any pitch in horizontal/ vertical or curved surfaces, excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required.	218.92	sqm		
2	12.28.2	Dismantling roofing including ridges, hips, valleys and gutters etc., and stacking the material within 50 metres lead of: Asbestos cement sheet or polycarbonate sheet	183.92	sqm		

SECTION III

ARTICLES OF AGREEMENT

Articles of agreement made this ……..….. day of…….. between …… having its Registered office at ……..... (Here in after referred to as the Employer/Owner which expression shall include its successor or successors and assigns) of the one part.

AND

M/s…….. having its registered office at …… ……..……..... and head office……. (Here in after referred to as the Contractor of the other part).

Whereas the Employer/Owner is desirous of Executing Civil works, water supply and public health works including internal electrification work, for the C/o Indraprastha college Delhi as stated herein Tender Document (here in after called the work.)

And whereas the Employer/Owner in order to effectively carry out the said work has appointed M/S Swati Structure Solutions Pvt. Ltd, here in after referred to as (the Architect/Consultant) to prepare plans, drawings and specifications describing the same to be executed.

And whereas the Employer/Owner has made the Plans, Drawings as per lists attached, specifications priced schedule of quantities for the work as per instructions to tenderers, General conditions of contract and special conditions of contract prepared with assistance of the said Architect / consultant subject to which the offer of the contractor shall be accepted.

And whereas the said Architect/Consultant has issued drawings etc. therefore to the contractor. The drawings attached with tender documents are informative and additional working drawings shall be separately issued and the contractor has to execute the work as per working drawings without any extra payment or claim.

And Whereas the relevant drawings inclusive of the specifications, priced schedule of quantities, instruction of tenderer, general condition of contract and special conditions and letter exchanged by and between the parties from submission of Pre-Qualification document, tender up to acceptance including letter of order (herein after collectively referred to as the said conditions) have been signed by the parties here to and the contractor has agreed to execute the work upon and subject to the said conditions.

Now it is hereby agreed as follows:

1. In consideration of the payments to be made to the contractor as hereinafter provided the contractor shall upon and subject to the said conditions execute and complete the works as described in the said specifications and the said priced schedule of quantities.
2. The employer will pay to the contractor the sum of Rs.----------(Rupees----------
   ----------)
   (Here in after called the contract sum) or such other sum as shall become payable here under at the times and in the manner specified in the said conditions.

3. The terms Architect/ Consultant in the said conditions shall mean the same and in the event of the said Architect/ Consultant ceasing to be the Architect / Consultant for the purpose by the Employer, provided always that no person subsequently appointed to be the Architect /Consultant under this contract shall be entitled to disregard or over rule any decision or approval expressed in

writing by the outgoing Architect/ Consultant for the time being if the same had been done under instructions from the employer.

4. The agreement and documents mentioned above shall form the basis of this contract and all disputes to be decided in the manner prescribed in the condition attached here to.

5. The said contract comprises civil works, water supply and public health works including internal electrification works as mentioned above and in the tender documents and all subsidiary work connected there within the same site as may be ordered to be done from time to time by the said employer through the Architect/ Consultant or other Architect/ Consultant the case may be even though the said work may not be shown on the drawing or described in the said specification or the priced schedule of quantities.

6. Notwithstanding what is stated herein before or hereinafter or in the instruction to the tenderer, general conditions of contract, special conditions, the employer through the Architect/ Consultant reserves to himself the right to alter the nature of the work and of adding to or, omitting any items of works from the contract or of having portions of the same carried out Entirely or otherwise and such alterations or variations shall be carried out without prejudice to this contract.

7. The contractor will raise the bill (to be submitted in triplicate) for the work executed at site and payment will be made by the owner within 15 (Fifteen) days from the date of submission of bill and approval of bill.

8. The above conditions shall be read and be treated as forming part of this agreements and the parties hereto will respectively be bound hereby and to abide by themselves to the conditions and stipulation and perform the same on their parts to be respectively observed and preferred.

AS WITNESS our hand this Day of

SIGNED by the said
in presence of : Employer

SIGNED by the said in the
presence of : Contractor

Witness

(1) Name of ----------
Address: - .....
Occupation: -.....

(2) Name of ----------
Address: - .....
Occupation: -.....

SECTION – IV

INSTRUCTION TO TENDERERS

1. The EMPLOYER through the ARCHITECTS does not bind itself to accept the lowest or any tender and reserves to itself the right to accept or reject any or all the tenders, in whole or in part without assigning any reasons for doing so.

2. All erasures and alterations made while filling the tender must be attested by initials of the Tenderer. Overwriting of figures is not permitted; failure to comply with either of these conditions will render the tender void. No advice of any change in rate or condition after the opening of the tender will be entertained.

3. The CONTRACTOR must not sublet any portion of the contract except with the written consent of the EMPLOYER failing which the ARCHITECT/EMPLOYER may serve a notice in writing rescinding the contract whereupon the security deposit shall stand forfeited and at absolute disposal of the EMPLOYER.

4. Time shall be considered as the essence of the Contract. The Entire constructions must be completed in 15 (Fifteen) Months including internal electrical installations, installation of cable T.V./Telephone Cabling installation of internal sanitary and internal water supply arrangements and all external development works etc. It is intended that all general works should be so completed so as to leave the last two months for installations and finishing cleaning and handing over items. The attentions of the tenderer are drawn to clause (13) of the general conditions of the contract referring to damages for non completion. The tenderer shall before commencing work prepare a detailed work programme to achieve timely completion of the work which shall be approved by the ARCHITECT and EMPLOYER and shall be adhered to The CONTRACTOR is bound to carry out any items of work necessary for the completion of job even though such items are not included In strictly the schedule of area/quantities and rates. Instruction in respect of such additional items and their quantities will be issued in writing by the EMPLOYER through ARCHITECT.

5. LAND FOR CONTRACTORS ESTABLISHMENT

For the purpose of construction of contractor's store yard, godowns, site office, etc. the Contractor may utilize with the permission of the architect/ consultant, portion of the land belonging to the employer if available at such location as would not interface with the execution of the work. The contractor shall for this purpose submit to the Architect/consultant for his approval a plan or plans of the proposed layouts for the site facilities. The Architect/ consultant reserve the Right to modify the contractor's proposal as he may deem fit.

6. WATER.

The rates quoted by the contractor shall include all expenditure for providing all the water for the full contract period required for the work, including for the people at work and all staff on the site. He shall make his own arrangement for the supply of good quality water suitable for use in the work and the work people. He shall obtain Municipal connection and all charges for the connection and consumption shall be born by him. If Municipal water is not available or inadequate, he shall make other arrangements like sinking tube wells or making bore wells or transport from outside by tanker or any other suitable means entirely at his cost and no separate payment shall be made for the same.

7. POWER

The contractor shall at his own cost arrange for necessary power for construction and lighting for the entire period of contract. If however separate power is available in the premises, the contractor shall make his own arrangement to obtain necessary connections, maintain and efficient service of Electric lights and power and shall pay for all the requisite charges for the same.

The Employer, as well as the Architect / Consultant shall give all the recommendations necessary to obtain power and water connections from the concerned authorities, but the responsibility for obtaining the same shall rest with the contractor. If any other Contractor, appointed by the employer, is required to use water and power, he shall be allowed to use the same and make temporary connections from the supply arranged by the main Contractor at rates and terms that may be mutually agreed upon by both, failing which, at rate, terms and conditions that may be decided by the Architect/ consultant.

8. FIRST – AID FACILITIES & LIABILITIES

The Contractor shall at his own expense arrange to ensure availability of medical attendant promptly when necessary. He shall provide properly equipped first –aid station in-charge or qualified persons at suitable location nearest to the Hospital. The Contractor shall be responsible for any liability which may be excluded from the insurance policies and also for all other damages to any person, animal or property arising out of incidental to the negligence or defective carrying out of this contract. He shall also indemnify the employer in respect of any cost, charges or expenses arising out of any claims or proceedings and also in respect of any award of compensations and damages arising there from.

The employer shall with the concurrence of the Architect be entitled to deduct the amount of any damage ,compensation , cost charges and expenses arising from or occurring from ,or in respect of ,any such claims or damages from any or all sums due or become due to the contractor without prejudice to the employers other rights in respect thereof.

Accidental Policy for the labours working at site shall be on account of Contractor. He shall produce the same before start of work.

The liability arising out any accident, incident at the site is the responsibility of contractor and shall bear all the expenses, compensations, legal implications are to be settled by the contractor. All labour regulations related to welfare, health, Safety & Security of labour are to be strictly adhered by the contractor. Till the completion of building and handing over the completed work to the owner, the contractor shall be solely responsible for any mishaps or injury to the worker & damages to the structure of owner or neighbours which may arise from the operator's neglect or himself or his employee. Whether such injury or damage may arise from carelessness, accident or mishaps due to any reasons what so ever, contractor shall suitably and adequately compensate for damages to the effected party or persons as per applicable Government rules. The owner under no circumstances shall own any responsibility for any such accident/ mishaps and no financial responsibility shall devolve on the owner.

9. FIRE FIGTHING ARRANGMENTS

The contractor shall at his all expenses provide at suitable, prominent and easily accessible places requisite number of fire extinguishers of appropriate type and buckets some filled with sand and others with water.

10. REPORTS AND RETURNS

The contractor shall maintain at site daily records of progress with regard to the work carried out, labour engaged and construction equipment deployed .These daily record shall be made available /accessible to the employer / Engineers / Architect / Consultant as and when required by him.

Enlarged progress photographs are also to be submitted regularly by the contractor at no extra cost to the employer/owner.

11. SITE ORDER BOOK

For the purpose of quick communication, the contractor shall maintain and preserve at site, a book with machine numbered pages in triplicate. Any instruction / advice given and recorded in the site order book by the consultant / employer shall be considered as a notice served on the contractor.

12. The following documents will be required to be submitted by the tenderer along with tender:

i) Tender Documents duly signed and stamped on each page.

ii) List of equipments proposed to be deployed on work.

iii) List of staff proposed to be deployed on work.

iv) if you need to associate with another company in executing the works then this should be clearly mentioned in your offer.

v) The details of laboratory where the samples to be tested shall also to be indicated.

if any tenderer gives wrong information or suppresses any material facts, the employer/engineer shall be free to reject such a tender at any stage and even cancel the contract (after the acceptance of the tender) at the risk and cost of the tenderer.

13. CONTENTS OF TENDER DOCUMENTS.

The tenderer is expected to examine carefully all the contents of the tender documents including instructions, conditions, terms, specifications and drawings and take them fully into account before submitting his offer. Failure to comply with the requirements as detailed in these documents shall be at the tenderer's own risk. Tenders which are not responsive to the requirements of the tender documents will be rejected.

14. GENERAL INSTRUCTION TO TENDERER

14.1 Except for the items, for which particular specifications are given or where it is specifically mentioned otherwise in the description of the items in the schedule of quantities, the work shall generally be carried out in accordance with the "CPWD Specifications 2000 Vol. I & II with upto date corrections slips (Here in after to be referred to as CPWD Specifications) and instructions of Client/ Architect. Wherever CPWD Specifications are silent, the latest IS Codes / Specifications shall be followed.

14.2 The proposed building is a prestigious project and quality of work is of paramount importance. Contractor shall have to engage well experienced skilled labour and deploy modern T&P and other equipment to execute the work.

14.3 Samples including brand / quality of materials and fittings to be used in the work shall be got approved from the Client / Architect, well in advance of actual execution and shall be preserved till the completion of the work.

14.4 Unless otherwise specified in the schedule of quantities, the rates tendered by the contractor shall be all inclusive and shall apply to all lifts & all heights, floors including terrace, leads and depths and nothing extra shall be payable on this account.

14.5 The rates for all items of work shall, unless clearly specified otherwise, include cost of all labour, material, tools and plants, incidentals and other inputs involved in the execution of the item.

14.6 The contractor(s) shall quote all inclusive rates against the items in the schedule of quantities and nothing extra shall be payable for any of the conditions and specifications mentioned in the tender documents unless specifically specified otherwise.

14.7 Unless otherwise specified in the schedule of quantities the rates for all items shall be considered as inclusive of pumping / bailing out water, if necessary for which no extra payment shall be made. However, regarding level of water table Soil Investigation Report may be seen in the office of the architect and the same shall also be checked at site before quoting the rates.

14.8 The rate for all items, in which the use of cement is involved, is inclusive of charges for curing.

14.9 The foundation trenches shall be kept free from water while works below ground level are in progress.

14.10 The work shall be executed and measured as per metric dimensions (SI Units) given in the schedule of quantities, drawings etc. (FPS units wherever indicated are for guidelines only)

14.11 Any legal or financial implications resulting out of disposal of earth shall be the sole responsibility of the contractor. Nothing extra shall be paid on this account.

15. SPECIAL INSTRUCTION TO TENDERER FOR CIVIL WORKS

15.1 **(a)** The Contractor(s) shall inspect the site of work before tendering and acquaint himself with the site conditions and no claim on this account shall be entertained by the Employer.

(b) The contractor(s) shall get himself acquainted with nature and extent of the work and satisfy himself about the availability of materials from kiln or approved quarries for collection and conveyance of materials required for construction.

15.2 The tenderer shall see the approaches to the site. In case any approach from main road is required at site or existing approach is to be improved and maintained for cartage of materials by the contractor, the same shall be provided, improved and maintained by the contractor at his own cost. No payment shall be made on this account.

15.3 Contractor shall take all precautionary measures to avoid any damage to adjoining property. All necessary arrangement shall be made at his own cost.

15.4 The contractor shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night, speed limit boards, red flags, red lights and providing barriers. He shall be responsible for all damages and accidents caused to existing / new work due to negligence on his part. No hindrances shall be caused during the execution of the work.

15.5 Royalty at the prevailing rates wherever payable shall have to be paid by the contractor on the boulders, metal, shingle, sand and bajri etc. or any other material collected by him for the work direct to revenue authorities and nothing extra shall be paid by the Employer for the same.

15.6 The contractor shall provide at his own cost suitable weighing, surveying & leveling and measuring arrangements as may be necessary at site for checking. All such equipment shall be got calibrated in advance from laboratory, approved by the Client / Architect. Nothing extra shall be payable on this account. The equipment shall be calibrated at regular intervals during the period of contract.

15.7 The contractor shall take instructions from the Client / Architect regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed.

15.8 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of work. All such reference points shall be in relation to the levels and locations, given in the Architectural drawings.

15.9 Any cement slurry added over base surface (or) for continuation of concerning for better bond is deemed to have been included in the items and nothing extra shall be payable (or) extra cement considered in consumption on this account. For RCC work, only factory made round type cover block shall be used. For Brick work unless otherwise specified FPS bricks shall be used in all items of work. The classification of bricks brought by the contractor shall conform to the CPWD Specifications.

15.10 The contractor shall bear all incidental charges for cartage storage and safe custody of materials brought to site.

15.11 The work shall be carried out in accordance with the Architectural drawings and structural drawings, to be issued from time to time, by the Client / Architect. Before commencement of any item of work, the contractor shall correlate all the relevant architectural and structural drawings issued for the work and satisfy himself that the information available there from is complete and unambiguous. The discrepancy, if any, shall be brought to the notice of the Client/ Architect before execution of the work. The contractor alone shall be responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and or incomplete information.

15.12 (i) Quality of all materials brought to the site shall be got checked as per relevant BIS codes from the approved / reputed laboratories and inform the Client/ Architect or his any authorized supervisory staff on receipt of the same along with test certificates at site before use. The cost of testing shall be on account of contractor, nothing extra is payable.

(ii) All material shall only be brought at site as per program finalized with the Client / Architect. Any redelivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

(iii) The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material / work beyond set-out tolerance limit shall be summarily rejected by the Client / Architect & contractor shall be bound to replace / remove such sub-standard / defective work immediately at his own cost / at no extra cost.

15.13 The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material / work beyond set-out tolerance limit shall be summarily rejected by the Client / Architect & contractor shall be bound to replace / remove such sub-standard / defective work immediately at his own cost / at no extra cost. The contractor shall conduct his work, so as not to

interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Client/ Architect and shall as far as possible arrange his work and shall place and dispose off the materials being used or removed so as not to interfere with the operations of other contractor or he shall arrange his work with that of the others in an acceptable and in a proper co-ordination manner and shall perform it in proper sequence to the complete satisfaction of others.

15.14 The Architectural drawings given in the tender other than those indicated in nomenclature of items are only indicative of the nature of the work and materials/fixings involved unless and otherwise specifically mentioned. However, the work shall be executed in accordance with the drawings duly approved by the Client / Architect.

15.15 PROGRAMME CHART:-

i) The Contractor shall prepare an integrated program chart for the execution of work, showing clearly all activities from the start of work to completion, with details of manpower, equipment and machinery required for the fulfillment of the program within the stipulated period and submit the same for approval of the Client/ Architect within two weeks of the award of the contract. The contractor shall draw the program keeping in view the activities to be taken. It is obligatory on the part of contractor to adhere to the program approved by the client/ architect

ii) The program chart should include the following:-

a) Descriptive note explaining sequence of various activities.

b) PERT / CPM / BAR-CHART prepared on M.S. Project which will indicate resources in financial terms, manpower and specialized equipment for every important stage.

iii) If at any time, it appears to the Client / Architect that the actual progress of work does not conform to the approved program referred above, the contractor shall produce a revised program showing the modifications to the approved program by additional inputs to ensure completion of the work within the stipulated time. However, for every three months the employer will review the progress vis-a-vis Programme submitted

iv) The submission for approval by the Client/ Architect of such program or the furnishing of such particulars shall not relieve the contractor of any of his duties or responsibilities under the contract. This is without prejudice to the right of Client/ Architect to take action against the contractor as per terms and conditions of the agreement.

15.16 Normally contractors shall not be allowed to work at night. Work at night shall, however, be allowed if the site conditions / circumstances so demand. However, if the work is carried out in more than one shift or at night, no claim on this account shall be entertained. In such situations the contractor shall make available to the Employer proper means of communications such as vehicle at his own cost.

15.17 Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar services encountered in the course of the execution of work shall be protected against the damage by the contractor's own expense. The contractor shall not store materials or otherwise occupy any part of the site in a manner likely to hinder the operation of such services

15.18 The contractor shall be responsible for the watch and ward / guard of the buildings, safety of all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him

against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the Employer. No extra payment shall be made on this account.

15.19 The day to day receipt and issue accounts of cement shall be maintained separately in the standard Performa given by the Client / Architect and which shall be duly signed by the contractor or his authorized representative.

15.20 The contractor shall be fully responsible for the safe custody of materials brought by him or issued to him even though the materials are under double lock key system.

15.21 The contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and clearance of the same before use in the work. Any redelivery of the materials not required for immediate consumption shall not be resorted to. The contractor shall provide at his own cost suitable weighing and measuring arrangements at site for checking the weight / dimensions as may be necessary for execution of work.

15.22 For construction works which are likely to generate malba / rubbish to the tune of more than a tempo / truck load, contractor shall dispose of malba, rubbish & other unserviceable materials and wastes at his own cost to the notified specified dumping ground and under no circumstances these shall be stacked / dumped even temporarily, outside the construction premises.

15.23 The contractor shall arrange at site centering and shuttering required before start of the work. In case the completion schedule requires more quantity of centering and shuttering, the contractor shall do so at no extra cost to the Employer.

16. SUPPLY OF MATERIALS

16.1 Cement, Steel (TMT Bars) and Structural steel will be procured by the contractor.

16.2 The account of the cement and steel shall be kept in proper register.

16.3 The contractor shall be fully responsible and accountable for safe custody and proper care to prevent damage or deterioration of theft of the cement and steel brought at site.

17. SCHEDULE OF APPROVED BRAND NAMES OF MATERIALS:

All materials specified in these specifications and condition of contract must confirm to the following brand name, and should be of first quality. BIS marked wherever available. Fabricated items shall be manufactured in accordance with the CPWD / ISI specifications and should be of first quality. Samples of all materials to be used must be submitted and got approved before procurement.

NO.	Item	Brand specified (or as approved by Architect/Employer)
1.	Flush doors	Jyoti/Donear/Green or ISI Marked
2.	Plywood/blockboard	
	Soft board.	Jyoti/Donear/Green or ISI Marked
3.	Aluminium hardwares	Oxford, Classic, Arches, or equivalent
4.	Locks (Mortice)	Godrej, Golden
5.	Glazed titles	Somani, Kazaria, Orient
6.	Ceramic floor titles	Somani/Kazaria/Regency

7.	Coarse sand	Baderpur sand of fineness modulus
8.	Stone aggregate	Clean Blue Delhi quartzite stone (Free of any foreign material)
9.	Laminate (1.0mm thick)	Formica, Sanctuary, Greenlam
10.	Teak vencer (Natural)	Archid, Duro, Donear
11.	Sealant/ Additive	Assian Paints, Fosroc
12.	Glass	Modiguard, Saint Gobain
13.	Polymers sealant Concrete additive.	CICO
14.	Water proofing Treatment	CICO No. 1 (Liquid) / Pidilite
15.	Anti-termite treatment	Pest control Co., Pest Control Incorp Pest (I) Co., Member of IPCA
16.	Paints	ICI, Asian, Berger, Shalimar all Ist Quality Snowcem (only for exterior)
17.	Adhesive	Fevicol, Mowicol
18.	Water stops	Fixopan, L1oyd 150mm double shoes.

SANITARY:

1.	Vitreous china sanitary ware	Parry wares (IS-2556) Nycer/CERA, Hindware.
1A.	Cistern (China ware) Hindware Sleek (Hindware) Cistern (P.V.C.) For L.W.C.	Parry ware (water saver-do- flushing operation liver from top of the cistern.)
2.	Plastic W.C. Seats Cover	Commander (IS-2548) equivalent (Good quality)
3.	CP fittings & toiletries	Dripless/Parko.
4.	C.P. Waste, spreaders flush pipes - CAMRY	Marc or equivalent make.
5.	Soil, Waste & rainwater pipe & fittings:	
	a. PVC Pipes	Fineless polypick
	b. PVC fittings	(6Kg/cm^2) Setia
	c. CI pipes	RIF/HINDUSTAN
6.	Gunmetal Values (Fullway check and globe values)	Leader/Sant or ISI make.
7.	Gully traps	Perfect or Burn (IS-651)

8.	CI Main hole covers & frames	B.C.I/SKF/SIF
9.	G.I. Pipe	Jindal Hissar B-class
10.	Ball valve	Audco/Zoloto/Rapid Conroll
11.	Brass foot valves	Leader/Sant
12.	R.C.C. Pipe	Indian hume pipe or ISI.
13.	GI fittings	Unik
14.	Horizontal/Vertical check valves	Zoloto/leader
15.	Pressure reducing valves	ITT/Zoloto/Audco
16.	Globe Valve	Audco/Bankim-sarkar/zoloto
17.	SFRC manhole & drain cover	Heavy duty conferming to ISI-2592
18.	Kitchen sink	Jayana/ Neelkanth
19.	Mirror	Modi-guard

18. LIST OF APPROVED MANUFACTURERS FOR DIFFERENT MATERIALS TO BE USED FOR ELECTRICAL WORK
(All materials shall be ISI mark)

S.NO.	Detail of Materials	Manufacturers Name/Brand Name
1.	PVC Conduit	BEC / ATUL / AKG
2.	PVC Insulated copper conductor FR cable	FINOLEX / R R CABLE / NATIONAL / BONTON
3.	Modular Plate Switch	LEGRAND (MOSAIC) / CLIPSAL (OPALE)
4.	MCBDB	LEGRAND / SEIMENS / ADHUNIK
5.	MCB	LEGRAND / GE / SCHNEIDER (MG)

19. AMENDMENT TO TENDER DOCUMENTS.

At any time prior to the deadline for the submission of tenders, the Engineer may, for any reason, whether at his own initiative or in response to a clarification or query raised by a prospective tenderer, modify the tender documents by an amendment.

The said amendment in the form of an addendum will be sent to all prospective tenderers who have received the tender documents, to reach them 2 days prior to the deadline for the submission of tenders. This communication will be in writing or by telefax and the same shall be binding upon them. Prospective tenderers should promptly acknowledge receipt thereof by telefax to the Engineer.

In order to afford prospective tenderers reasonable time for preparing their tenders after taking into account such amendments, the Engineer or the Employer may, at his discretion, extend the deadline for the submission of tenders.

20. LANGUAGE OF TENDER.

The tender prepared by the tenderer and all correspondence and documents relating to the tender exchanged between the tenderer and the Employer/Engineer shall be in the English language.

21. TENDER PRICES

The tenderer is required to quote for all the items as per tender documents.

The rate for each item shall be reasonable and not unbalanced. If the Engineer comes across any unbalanced rates, he may require the

tenderer to furnish detailed analysis to justify the same. Should the tenderer fail to comply with this, his tender shall be liable to be rejected by the employer, who may award the contract to any other tenderer.

In case of any discrepancy in rate quoted for individual item and its amount , the rate quoted is final for the purpose of all calculations and payments.

The tenderer shall keep the contents of his tender and rates quoted by him confidential.

22. CURRENCIES OF THE TENDER

Tender prices shall be quoted in Indian Rupees only.

23. TENDER VALIDITY

The tender shall remain valid and open for acceptance for a period of 60 days after submission of offer.

24. EARNEST MONEY DEPOSIT (EMD)

The tenderer shall furnish, as Earnest Money Deposit (EMD) as specified in para -1.1 of NIT.The Earnest Money Deposit (EMD) shall be in the form of a bank draft on any Scheduled bank payable at New Delhi.

Any Tender not accompanied by an acceptable EMD will be summarily rejected by the Employer as non-responsive.

The Earnest Money Deposit (EMD) of the unsuccessful tenderer shall be returned upon executing the contract agreement by successful tenderer. The Earnest Money Deposit (EMD) shall be adjusted against security deposit against each running bill.

Earnest Money Deposit (EMD) will be forfeited in the following cases

a. If the Tenderer withdraws / modifies his tender during the period of tender validity

b. If the tenderer after award of work, does not start the work within the stipulated time tion

c. period as per letter of award

No interest will be payable by the Employer on the Earnest Money Deposit (EMD) amount cited above

25. SIGNING OF THE TENDER

Entries to be filled in by the Tenderer shall be typed or written in indelible ink. Each page of the documents should be signed in full at the bottom by the person submitting the Tender along with the date of signing. The person signing/initiating the documents shall be one who is duly authorised in writing by or for and on behalf of the Tenderer and/or by a Satute Attorney of the Tenderer. Such authority in writing in favour of the person signing the tender and/or notarially certified copy of the Power of Attorney as the case may be, shall be enclosed along with the tender.

The complete tender shall be without alterations, overwriting, interlineations or erasures except those to accord with instructions issued by the Employer, or as necessary to correct errors made by the tenderer. All amendments/corrections shall be initialed by the person or persons signing the tender.

26. CLARIFICATION OF TENDERS

To assist in the examination, evaluation and comparison of Tenders, the Engineer / Employer may ask tenderers individually for clarification of their tenders, including Breakdowns of prices. The request for clarification and the response shall be in writing or by telefax but no change in the price or substance of the tender shall be sought, Offered or permitted except as required to confirm correction of arithmetical errors Discovered by the Engineer during the evaluation of tenders.

Prior to the detailed evaluation of tenders, the Engineer will determine whether each tender is responsive to the requirements of the tender documents.

The Employer/Engineer will award, the contract to the tenderer, whose tender has been determined to be substantially responsive, complete and in accordance with the tender documents and whose evaluated Price has been determined to be the lowest. Negotiations, if any, shall be carried out with lowest responsive tenderer.

27. EMPLOYER'S RIGHT TO ACCEPT ANY TENDER AND TO REJECT ANY OR ALL TENDERS

The Employer reserves the right to accept or reject any tender, and to annul the tender process and reject all tenders, at any time prior to award of contract, or to divide the contract between / amongst tenderers without thereby incurring any liability to the affected tenderer or tender's or any obligations to inform the affected tenderer or tender's of the grounds for the Employer's action.

28. SIGNING OF AGREEMENT

The Engineer/Employer shall prepare the Agreement in the Proforma included in this Document, duly incorporating all the terms of agreement between the two parties. However, the successful tenderer shall arrange the necessary Non-judicial stamp Papers of requisite value and attend the Owmer office to execute the agreement Within two weeks of the date of receipt of the "Letter of acceptance" duly Acknowledged and signed by the successful tenderer. Up on executing the agreement the original agreement will be retained by the employer and one copy of the Agreement duly signed by the Employer and the Contractor through their authorized Signatories will be supplied by the Employer to the contractor.

29. RISKS AND COST

In case contractor fails to complete work as per schedule, Owner has discretion to get the work done completed by any other agency at risk and cost of the agency to which the work has initially been awarded by giving seven days notice.

30. SAFETY PRECAUTIONS DURING PROGRESS OF WORKS

The contractor shall take all precautions to ensure safety of the staff, existing utility services, adjoining structures etc., during progress of work. The contractor shall also make necessary arrangement for the safety of his workers, if any accident occurs, the entire responsibility fall on the part of the contractor.

31. FORCE MAJEURE

War, invasion, revolution, riot, sabotage, lockouts, strikes, work shut down imposed by Government, acts of legislative or other authorities, stoppage in supply of raw materials, fuel or electricity, break down of machinery by mob or mass, act of God, epidemic, fires, earthquakes, floods, explosives, accidents and navigation blockages, or any other acts or events whatsoever, which are beyond reasonable controls of contractor and which shall directly or indirectly prevent completion of project within the time specified in the agreement, will be considered Force Majeure. Owner shall grant necessary extension of completion date to cover the delays caused by Force Majeure without any financial repercussions

32. SETTLEMENT OF DISPUTES.

Matters will be finally determined by Owner. All disputes and differences of any kind whatsoever arising out of or in connection with the contractor, whether during the progress of the works or after their completion and whether before or after the determination of the contract shall be referred by the contractor to and Owner shall within a reasonable time after their presentation made and notify decisions thereon in writing. The decisions, directions, classification, measurements drawings and certificates with respect to any matter the decision of which is specially provided for by these or other special conditions, given and made by the Owner or a by the Engineer on behalf of the Owner, are matters which are referred to hereinafter as accepted matters and shall be final and binding upon the contractor and shall not be set aside on account of any infirmity, omission, delay or error in proceedings, In or about the same or any other ground or for any other reasons and shall be without appeal. In the event of any dispute or differences between the parties hereto as to the construction or operation of this contract or the respective rights and liabilities of the parties on any matter in question, dispute or differences on any account, or as to the withholding by Owner of any certificate to which the contractor may claim to be entitled to or if the Owner fails to make a decision within a reasonable time, then and in any such case, the contractor after 30 days of presenting his final claim on disputed matter may demand in writing that the dispute or differences be referred to arbitration. Such demand for arbitration shall specify the matters which are in question dispute or differences and only such disputes or differences of which the demand has been made and no other, shall be referred to arbitration, obligations during tendency of arbitration work under the contract, shall unless otherwise directed by the Engineer, continue during the arbitration proceedings and no payment due or payable by Owner. shall unless withheld on account of such proceeding, provided however, it shall be open for the arbitrator or arbitrators to consider and decide whether or not such work should continue during arbitration proceedings.

33. ARBITRATION

Matters in question, dispute or differences to be arbitrated upon shall be referred to for decision to a sole arbitrator who shall be a nominated person appointed by Management of Owner, whose decision shall be final and binding to the contractor.

The work shall be continued as per programme during pendency of arbitration.

34. ON ACCOUNT PAYMENT

The Contractor shall be entitled to take from time to time by way of on account Payments only for such works as in the opinion of Owner he has executed in terms of the Contract. A certificate of measurement shall be subject to any deduction which may be deemed necessary by Owner for non-execution of any work or any part of the work.

35. RUNNING PAYMENTS NOT PREJUDICIAL TO FINAL SETTLEMENT

Running payment made to the contractor shall be without prejudice to the final payment of accounts (except where measurements are specifically noted in the measurements book as final measurements and as such have been signed by the contractor) and shall in no respect be considered or used as evidence of any facts stated or in or to be inferred from such accounts not of any particular quantity of works having been executed nor of the manner of its execution being satisfactory.

36. PAYMENT TO CONTRACTOR.

The payment to the contractor shall be made as per the actual work done at site after submission of bills in triplicate duly verified by PMC/ Architect/ Engineer at a frequency of 45 Days or when the value of work exceeds Rupees 40Lakhs

37. SECURITY DEPOSIT

Security Deposit @ 5% of value of the work done subject to Rupees 25 Lakhs which shall be withheld on every running account bill and the same will be released on completion of defect liability period to the entire satisfaction of owner/ Architect/ PMC. Any defects/ flaws found in work during this period shall have to be rectified by contractor. In case of non compliance such the security Deposit will be forfeited.

38. Certificate of completion of work

As soon as in the opinion of the Owner, Architect & Consultant, the work shall have been substantially completed the Owner shall issue a certificate of completion in respect of work.

39. Other Conditions

In case of premature termination, no extra compensation shall be payable. Payment of remuneration in that case will be made to the extent the services rendered till that time can be made use of by Owner limited to the period for which the agency had actually rendered the service and subject to the intermediate targets being adhered to as per the work schedule mutually agreed to. No notice of termination or remuneration There of will be necessary and continuance shall be solely at the discretion of owner.

All the documents and drawings created out of the assigned work will become the sole property of the Owner and Owner will be free to use the same in any manner deemed fit.

The agency will exercise all responsible skill, care and diligence in the performance of the service under this work and shall carry out all the responsibilities with recognized latest professional standards.

All the work area shall be properly barricaded as per directives if Engineer. Necessary watch and ward luminous indicators etc. as required shall be provided at the cost of the contractor. Reflective paint/tape shall be provided on barricades to ensure safety at night. Adequate measures shall be taken to ensure that no water or soil spillover the road. The specifications for the works are attached. All work shall be carried out in accordance with relevant IS codes or any other internationally accepted standards e.g. British Standards or ASTM.

Quality of the work undertaken is of paramount importance. The thrust of the investigation is to obtain good quality and reliable technical data, which will form the basis of subsequent design. Constant site supervision will be necessary to ensure that the desired end result is obtained. if you need to associate with another company in executing the works then this should be clearly mentioned in your offer. The details of laboratory where the samples to be tested shall also to be indicated.

SECTION –V

GENERAL CONDITIONS OF CONTRACT

Except where provided for in the description of the individual items in the schedule of quantities and in the specification and conditions laid down here in after and in the drawings, the works shall be carried out as per standard specifications and under the direction of the employer / architect

1. DEFINITIONS & INTERPRETATIONS:

In construing these conditions, the specifications, bill of quantities and contract agreement etc., the following words shall have the meaning herein assigned to them except where the subject or context otherwise required.

Ia. "Employer" means **I.P. College** at 31, Sham Nath Marg, Alipur Road Delhi, it includes the EMPLOYER, successors and assigns.

Ib. "Architect" means M/s. Swati Structure Solutions Private Limited, 503, Sachdeva Corporate Tower, Plot # 08, Sector-8, Rohini, Delhi- 110085- **Tele No. 09953416367,** and their authorized nominees and representative or such other

Ic. "ENGINEER" means clerk of works (paid by the society) and shall be nominated by the EMPLOYER in writing or the technical representative of the EMPLOYER at site for all matters pertaining to execution, supervision, quality control etc.

II. "Contractor" is the successful tenderer in whose favor the contract has been awarded by the EMPLOYER to perform the works covered by the contract and shall be deemed to include the Contractors 'successors, heirs, executors, administrators, representative or permitted assigns approved by the EMPLOYER and will be referred to as if on masculine gender and singular \ number throughout in these documents.

2. ASSIGNMENT AND SUB-CONTRACTING:

The CONTRACTOR shall be deemed to have based his sufficiency of the tender on the data made available by the EMPLOYER and of Tender on his own inspection & examination, all as mentioned. The contractor shall be deemed to have satisfied himself as to and prices stated in the Schedule of rates, all of which shall except or otherwise provided in the contract, cover all his obligations under the contract (including those in respect of supply of goods, material, plants or services and contingencies) and matter the things necessary for the proper execution completion of the work including rectification of defects.

The CONTRACTOR shall not without prior approval /consent of the EMPLOYER/ARCHITECT assign the contract or any part thereof, provided that the CONTRACTOR shall not be required to obtain such consent for:

a. The provision of labour.
b. The purchase of material.
c. The sub-contracting of any part of the work for which the sub-contractor's name is mentioned in the tender.

2.1 If any dispute / ambiguity / discrepancy arises between the CONTRACTOR and the ARCHITECT/ENGINEER pertaining to the interpretation of the contractor Agreement, the same

shall be the referred to the EMPLOYER whose decision shall be final and binding on both the parties.

2.2 Adverse physical obstruction's or conditions: If however arise, during the execution of the work the contractor faces physical obstruction or physical conditions, other than climate conditions on the site than he shall forthwith give notice to the ARCHITECT in writing, with a copy to the EMPLOYER, on receipt of such notice, the ARCHITECT shall, in his opinion such obstruction or condition which the CONTRACTOR, determined, any extension of time to the contractor, after obtaining approval from the Employer.

3. LETTER OF ACCEPTANCE:

Before signing of the contract, the EMPLOYER shall issue by hand or by registered post or otherwise dispatch at the registered office of the contractor, letter of acceptance for execution of the work in accordance with contract until a formal contract agreement is prepared and executed, the tender documents agreement letter, area schedule, payment schedule general conditions of contract, scope of work and specifications and documents submitted by tenderer to gather correspondence exchanged from the receipt of the tender to acceptance and together with the Employer's letter of acceptance along with the documents mentioned at 1.2.3 of NIT shall constitute a binding contract between the parties.

4. CONTRACTOR'S SUPERINTENDENCE:

The CONTRACTOR and his authorized agent/ staff (approved by the EMPLOYER/ ARCHITECT) shall provide all necessary superintendence during the execution of the works and as long as the ENGINEER may consider necessary for the proper fulfilling of the CONTRACTOR's obligations under the contract.

Proper team of Engineers, Planners, Architect, Support Staff, Technical Assistants, Clerical Staff, Skilled & Unskilled labour shall be deployed at site for completion of the work.

a) Site in charge- A graduate Civil ENGINEER having minimum 15 years experience and adequate exposure to various works of similar nature or
magnitude. The non-deployment of this Site Engineer shall cause EMPLOYER to recover Rs. 25, 000/- P.M. from the contractor.

b) Additional ENGINEER staff/ Technical assistants- who are qualified including qualified electrical, sanitary and plumbing ENGINEERS experienced in their respective fields and leading hands who are competent to give proper supervision ensuring quality and output of the work, are required to supervise the work including all services. The non-deployment of these Technical assistants shall cause EMPLOYER to recover Rs. 15, 000/- P.M. from the contractor.

c) Such skilled, Semi-skilled, unskilled labours as are necessary for the proper timely execution, completion of the works.

5. QUANTITY VARIATIONS:

The detail of area, unless otherwise stated shall be deemed to have been prepared in accordance with the approved drawings, measurement of the area are to be considered as estimated and not accurate because if any changes are required at the time of construction due to some practical problems, any

change due to change of some bye-laws etc. but subject to a maximum variation of the total area/ contract value by (+/-) 25%. The contractor shall execute the same at the original contract rates only.

6. EXTENSION OF TIME FOR COMPLETION:

If in the opinion of EMPLOYER/ ARCHITECT the works be delayed for reasons beyond the control of the CONTRACTOR, the Society may give a fair and reasonable extension of time for completion of the construction works.

If the CONTRACTOR needs an extension of item for the completion of the work or if the completion of work is likely to be delayed for any reasons beyond the due date of completion stipulated in the contract, the CONTRACTOR shall apply to the EMPLOYER for extension of time in writing at least 30 days before the expiry of the Scheduled time and while applying for extension of time CONTRACTOR shall furnish the response in detail and his justification, if any for the delays. While granting extension, the EMPLOYER shall notify the CONTRACTOR the period of time which will not qualify for imposition of liquidated damages.

7. TENDERER SHALL VISIT THE SITE

Intending tenderer shall visit the site and make himself thoroughly acquainted with the local site condition. Nature and requirement of the work, facilities of transport condition. Effective labour and materials, access and storage for material and removal of rubbish. The tenderer shall provide in their for cost of carriage, freight and other charges as also for any special difficulties and including police restrictions for transport etc. for proper execution of work as indicated in the drawings. The successful tender will not be entitled to any claim of compensation for difficulties faced or loses incurred on account of any site condition of the Employer/Architect might be deemed to have reasonably been inferred to be existing before commencement of work.

8. GOVERNMENT AND LOCAL RULES

The contractor shall confirm to the provision of all local bylaws and Acts relating to the work and to the Regulations etc. of the Government and local Authorities and of any company with whose system the structure is proposed to be connected. The contractor shall give all notices required by the said Acts, Rules, and Regulations Bylaws etc. and pay all fees payable to such Authority / Authorities for execution of the work involved. The cost, if any shall be deemed to have been included in his quoted rates, taking into account all liabilities for licenses, fees for footpath encroachment and restorations etc. and shall indemnify the employer against such liabilities and shall defend action arising from such claims or liabilities.

9. TAXES AND DUTIES

The tenderer must include in their tender prices quoted for all duties, royalties, access, excise, sales tax, work contract sales tax and Service Tax. Nothing extra shall be payable over and above quoted price.

10. QUANTITY OF WORK TO BE EXECUTED

The quantities shown in the Schedule of quantities are intended to cover the entire new structure indicated in the drawings but the Employer reserves the right to execute only a part or the whole or any excess there of without assigning any reason therefore.

11. CONTRACTOR TO PROVIDE EVERYTHING NECESSARY

The contractor shall provide everything necessary for the proper execution of the work according to the intent and meaning of the drawings, schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described therein provided that the same can reasonably be inferred there from and if the Contractor finds any discrepancies therein he shall immediately and in writing refer the same to the Employer /Architect whose decision shall be final and binding. The Contractor shall provide himself for ground and fresh water for carrying out the work at his own cost. The Employer shall on no account be responsible for the expenses incurred by the Contractor for hired ground or fresh water obtained from elsewhere.

The rates quoted against individual items will be inclusive or everything necessary to complete the said items of work within the contemplation of the contract, and beyond the unit price no extra payment will be allowed for incidental or contingent work, labour and/or materials inclusive of all taxes and duties whatsoever except for specific items, if any stipulated in the tender document. The Contractor shall supply, fix and maintain at his own cost, for the execution of any work, all tools, tackles, machineries and equipments and all the necessary centering, scaffolding staging, planking, timbering, strutting, shoring, pumping, fencing, boarding, watching and lighting of night as well as by day required not only for the proper execution and protection of the said work but also for the protection of the public and safety of any adjacent roads, streets, walls, homes, buildings, all other erections, matters and things and the Contractor shall take down and remove any all such centering, scaffolding, planking, timbering, strutting, shoring, etc, as occasion shall be required or when ordered so to do, and shall fully reinstate and make good all matters and things disturbed during the execution of work to the satisfaction of the Employer / Architect.

The Contractor shall provide such temporary road on site as may be necessary for the proper performance of the contract and for his own convenience but not otherwise. Upon completion, such road shall be broken up and leveled where so required by the drawings unless the Employer shall otherwise direct.

The Contractor shall at the times give access to workers employed by the Employer or any men employed on the buildings and to provide such parties with proper sufficient and if required, special scaffolding, hoists and ladders and provide them with water and lighting and leave or make any holes, grooves etc. in any work, where directed by the employer as may be required to enable such workmen to lay or fix pipes, electrical wiring, special fittings, etc. The quoted rates of the tenders shall accordingly include all these above mentioned contingent work.

12. TIME OF COMPLETION, EXTENSION OF TIME AND PROGRESS CHART

a) Time of Completion: The entire work is to be completed in all respects within the stipulated period. The work shall be deemed to be commenced within 10 (Ten) days from the date of issue of formal work order or the date on which the Contractor is instructed to take possession of the site whichever is earlier. Time is the essence of the contract and shall be strictly observed by the Contractor.

b) Extension of Time : If in the opinion of the Employer / Architect the work be delayed (a) by reason of any exceptionally inclement weather, or (b) by reason of instruction form the Employer / Architect in consequence of proceedings taken or threatened by or disputes, with adjoining or neighboring owners or (c) by the work, or delay, of other contractors or tradesmen engaged or nominated by the Employer / Architect and not referred to in the specification or (d) by reason of authorized extra and additions or (e) by reason of any combination of workmen or strike or lock-out affecting any of the building trades or (f) from

other causes which the Employer / Architect before the completion of the time allowed for the contract shall make fair and reasonable extension of time for completion in respect therefore. In the event of the Employer failing to give possession of the site upon the day specified above the time of completion shall be extended suitably. In case of such strikes or lock-outs, as are referred to above, the Contractor shall, Immediately give the Employer / Architect, written notice thereof. Nevertheless, the contractor shall use his best endeavors to prevent delay, and shall do all that may be reasonably required, to the satisfaction of the Employer / Architect to proceed with the work and on his doing so that it will be ground of consideration by the Employer / Architect for an extension of time as above provided. The decision of the Employer as to the period to be allowed for an extension of time for completion hereunder (which decision shall be final and binding on the Contractor) shall be promulgated at the conclusion of such strike or lock-out and the Employer shall then, in the event of extension being granted, determine and declare the final completion date. Hindrance Register shall be maintain and proper record of hindrances arisen and solved with the dates to be recorded in the register by the Owner's Site Engineer, Architect's Site Engineer and Contractor's authorized representative so that extension of time limit to granted can be derived from the register, and recommended by the Architect and approved by the Bank's competent authority.

c) Progress of work / Work program : During the period of construction the contractor shall maintain proportionate progress on the basis of a Program Chart submitted by the contractor immediately before commencement of work and agreed to by the Employer / Architect. Contractor should also include planning for procurement for scarce material well in advance and reflect the same in the Program Chart so that there is no delay in completion of the project.

i) Separate registers for receipt or consumption of all materials (building wise or as directed by the Architect) including steel cement, tiles, wood, lead, bitumen paints, electrical fittings and sanitary ware.

ii) Work force including supervisory staff, skilled and unskilled labours and their payment registers.

iii) Site Order book, Hindrance Register in triplicate with printed page numbers.

13. LIQUIDATED DAMAGES

Should the work be not completed to the satisfaction of the Employer / Architect within the stipulated period, the Contractor shall be bound to pay to the Employer a sum calculated @ 0.2% of the accepted contract sum per week of delay subject to a maximum of 2% of the accepted contract value by way of liquidated damages and not as penalty during which the work remains uncommented or unfinished after the expiry of the completion date.

14. TOOLS, STORAGE OF MATERIALS, PROTECTIVE WORK AND SITE OFFICE REQUIRENTS

The Contractor shall provide, fix up and maintain in approved position proper office accommodation for the Contractor's representative and staff, which offices shall be open at all reasonable hours to receive instruction notices or communications and clear away on completion of the work and make good all work disturbed.

All drawings maintained on the site are to be carefully mounted on boards of appropriate size and covered with a coat of approved varnish. They are to be protected form ravages of termites, ants, and other insects.

The Contractor shall provide at his own cost all artificial light required for the work and to enable other within contractors and sub contractors to complete the work the specified time.

The Contractor shall provide a suitable temporary hut for the use of workers and field staff and keep the same in a clean and sanitary condition to the satisfaction of the Public Health Authorities and shall cause such latrines and soil to be cleared away whenever necessary and shall make good all the work disturbed by these conveniences.

Every precaution shall be taken by the contractor to prevent the breeding of mosquitoes on the work during the construction and all receptacles. Cisterns, water tanks etc. used for indemnify the Employer against any breach of rules in respect of anti-malarial measures. The Contractor shall not fix or place any placards or advertisement of any description of permit the same to be fixed or placed in or upon any boarding gantry, building structure other than those approval by the Employer.

Protective Measures

The contractor from the time of being placed in possession of the site must make suitable arrangements for watching, lighting and protecting the work, the site and surrounding property by day, by night, on Sundays and other holidays.

The Contractor shall indemnify the Employer against any possible damage to the building roads, or member of the public in course of execution of the work.

The contractor shall provide necessary temporary enclosures, gates, entrances etc. for the protection of the work and materials and for altering and adopting the same as may be required and removing on completion of the work and making good all work disturbed.

The Contractor will have to provide watch and ward during the construction of the building and till:

i) Virtual completion
ii) Handing over of the buildings
iii) The work of all trades completed
iv) Defect liability period

Whichever is later or till it is occupied. No extra payment will be made for the above.

Storage of Materials

The Contractor shall provide and maintain proper sheds for the proper storage and adequate protection of the materials etc. and other work that may be executed on the site including the tools and materials of subcontractors and remove same on completion. Sheds for storage of cement are to have pucca floor raised above the ground. Cement godown shall be constructed for storing about six weeks requirements of cement and stored as per norms with a stack of 10 bags each one. Two ft. opening all around with two ft. passage of each stack. Structure shall be waterproof from all the sides and top. Cement should be stored one ft. above the ground level and have pucca raised floor.

So also reinforcement bars are to be stored above the ground level to prevent the same from getting rusted.

Tools

All tools, equipments and instruments as instructed by the Employer / Architect and considered necessary for the work shall be provided by the Contractor for the due performance of this contract.

All measuring, tapes shall be of steel and suitable scaffolding and ladders that way be required for safely taking measurement shall be supplied by the Contractor.

The ministries and the supervisors on the work shall carry with them always a one meter or two meter steel tapes and a measuring tape of 30 meters, a spirit level, a plumb bob and a square and shall check the work to see that the work is being done according to the drawing and specifications. The Site Engineer will use any or all measuring instruments or tools belonging to the contractors as he chooses for checking the work executed or being executed on the contract. The contractor should cover in his rates for making provision for all reasonable facilities for the use of his scaffolding, tools and plant etc. by sub-contractors for their work.

15. CLEARING SITE AND SETTING OUT WORK

The site shown on the plan shall be cleared of all obstructions, loose stone, and materials rubbish of all kinds. All holes or hollows whether originally existing or produced by removal or loose stone or materials shall be carefully filled up with earth well rammed and leveled off as directed at his own cost.

The contractor shall set out the work and shall be responsible for the true and perfect setting out of the work and for the correctness of the positions, levels, dimensions and alignment of all parts thereof. If at any time, any error shall appear during the progress of any part of the work the Contractor shall at his own expenses rectify such error, if called upon to the satisfaction of the Employer / Architect. The Contractor shall further set out the work to the alternative positions at the site until one is finally approved and the rates quoted in his tender should include for this and no extra on this account will be entertained.

16. CONTRACTOR IMMEDIATELY TO REMOVE ALL OFFENSIVE MATTERS

All soil, filth or other matters of an offensive nature taken out of any trench, sewer, drain, pool or other place shall not be deposited on the surface but shall be at once carted away by the contractor to a safe place as per rules of the appropriate authorities, i.e. The contractor shall keep the foundations and work free from water and shall provide and maintain at his own expenses electrical or other power driven pumps and other plant to the satisfaction of the Employer for the purpose, until the building is handed over to the Employer.

The Contractor shall arrange for the disposal of the water so accumulated to the satisfaction of the Employer and the local authority and no claims will be entertained afterwards if it does not include in his rates for the purpose.

17. ACCESS

Any authorized representative of the Employer / Architect shall at all reasonable times have free access to the work and/or to the workshops, factories or other places where materials are being prepared or constructed for the work and also to any place where the materials ore lying or from where they are being obtained, and the Contractor shall give every facility to the Owner or their representatives necessary for inspection and examination and test of the materials and workmanship. Except the representatives of the Employer and Architect no person shall be allowed at any time without the written permission of the Employer.

18. REMOVAL OF IMPROPER WORK

The Employer / Architect shall during the progress of the work have power to order in writing from time to time the removal from the work within such reasonable time or times as may be specified in the order of any materials which in the opinion of the Employer / Architect are not in accordance with specifications or instruction, the substitutions or proper re-execution of any work executed with materials or workmanships not in accordance with the drawing and specifications or instruction. In case the Contractor refuses to comply with the order the Employer / Architect shall have the power to employ and pay other agencies to carry out the work and all expenses consequent thereon or incidental thereto as certified by the Employer / Architect shall be borne by the Contractor or may be deducted from any money due to or that may become due to the contractor. No certificate which may be given by the Architect shall relieve the contractor from his liability in respect of sound work or bad materials.

19. SITE ENGINEER/ PROJECT MANAGEMENT CONSULTANT (PMC)

The term site Engineer / Project Management Consultant (PMC) shall mean the person appointed and paid by the Employer to supervise the work. The contractor shall afford the Site Engineer / PMC every facility and assistance for examining of the work and materials and for checking and measuring work and materials. The Site Engineer / PMC shall have no power to revoke, alter, enlarge or relax any requirements of the contract or to sanction any day work, additions, alternations, deviations of omission or any extra work whatever, except in so far as such authority may be specially conferred by a written order of the Employer.

The Site Engineer / PMC shall have power to give notice to the Contractor or to his foreman of non approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the Employer / Architect is obtained. The work will from time to time be examined by the Architect, Engineer from the Premises Department of the Employer and the Site Engineer / PMC. But such examination shall not in any way exonerate the Contractor from the obligation to remove any defects which may be found to exist at any stage of the work or after the same is complete. Subject to the limitations of this clause the Contractor shall take instruction only from the Employer / Architect.

20. OFFICE ACCOMMODATION FOR THE SITE ENGINEER/PMC

The Contractor shall provide, erect and maintain at his cost a separate simple water tight office accommodation for the Site Engineer / PMC in case it is not already available at site. This accommodation shall be well lighted and ventilated and provided with windows, door with a look. The Site Engineers/PMC's office shall be a minimum of 14 Sqm. (150 St.) and the Contractor shall provide a desk, chairs, drawers for keeping drawings, a cupboard having proper lock and a teak board for displaying drawings and lights and fans. The accommodation shall be demolished when directed.

21. DISMISSAL OF WORKMEN

The Contractor shall on the request of the Architect / Employer immediately dismiss from work any person employed thereon by him, who may in the opinion of the Architect / Employer be unsuitable or incompetent or who may misconduct himself. Such discharge shall not be the basis of any claim for compensation or damages against the Architect / Employer or any of their officer or employee.

22. ASSIGNMENT

The whole of the work included in the contract shall be executed by the Contractor and the Contractor shall not directly or indirectly transfer, assign or underlet the contract or any part, share or interest therein nor, shall take a new partner, without written consent of the Employer and no subletting shall relieve the Contractor from the full and entire
Responsibility of the contract or from active superintendence of the work during their progress.

23. MEASUREMENTS

Before taking any measurements of any work, the Site Engineer / PMC or a subordinate deputed by him shall give reasonable notice to the Contractor. If the Contractor fails to attend at the measurements after such notice/ or fails to countersign or to recorded the difference within a week from the date of measurement in the manner required by the Site Engineer/ PMC then in any, such event the measurement taken by the Site Engineer/ PMC or by the Subordinate deputed by him as the case may be is final any binding on the Contractor and the Contractor shall have no right to dispute the same.

24. VARIATION/ DEVIATION

The Contractor may when authorized and shall, when directed in writing by the Architect / Employer add and or omit, or very the work shown in the drawings or described in the specifications or included in the period schedule of quantities. The Contractor on his own accord shall make no addition, omission or variation without such authorization or direction by the Architect/ Employer shall when confirmed correctly by the Contractor in writing within 3 days shall be deemed to have been given in writing.

The price of all such addition/ non-tendered items will be worked out on the basis of rates quoted for similar items in the contract wherever existing or on engineering rate analysis based on prevalent fair price of labour, materials at site of work including wastage plus 10% towards Taxes and Contractor's profit, supervision, overhead etc. The tender rates shall hold good for variation in qty to any extend.

25. PREPARATION OF BUILDING WORK FOR OCCUPATION AND USE ON COMPLETION.

The whole of the work will be thoroughly inspected by the Contractor and deficiencies and defects put right completion of such inspection, he shall inform the Architect that he has completed the work and it is ready for inspection.

On completion, the Contractor shall clean all windows doors including cleaning and oiling, if necessary, of all hardware, inside & outside, all floors, staircases and every part of the building. He will leave the entire building neat and clean but ready for immediate occupation and to the satisfaction of the Employer/ Architect.

26. CLEARING SITE ON COMPLETION

On completion of the work the Contractor shall clear away and remove from the site/ complex all constructional plant surplus materials, rubbish and temporary work of every kind and leave the whole of the site and the work clean and in a workmanlike condition to the satisfaction of the Employer/ Architect.

27. DEFECTS AFTER COMPLETION

Contractor shall make good at his cost and to the satisfaction of the Employer/ Architect all defects, shrinkage, settlement or other faults which may appear within 6 (six) months after completion of the work and considered as the defect liability period. In default the Employer may employ and pay other person to amend and make good such damages, losses and expenses consequent thereon or incidental thereto shall be made good and borne by the Contractor and such damage loss and expenses shall be amending and making good by the Contractor, deduct from any money due to the Contractor a sum equivalent to the cost of amending such work and in the event of the amount retained being insufficient recover that balance from the Contractor from the amount retained under Clause No. 37 of ITT together with any expenses the Employer may have incurred in connection therewith.

28. CONCEALED WORK

The Contractor shall give due notice to the Employer/ Architect whenever any work is to be buried in the earth, concrete or in the bodies of walls or otherwise becoming inaccessible burial, in default whereof he shall, at the opinion of the Employer/ Architect be either opened up for measurement at the Contractor's expenses or no payment may be made for such materials should any dispute or defense arise after the execution of any work as to measurements etc or other matters which cannot be conveniently lasted or checked, the notes of the Employer/ Architect shall be accepted as correct and binding on the Contractor.

29. ESCALATION

The rates quoted shall be firm throughout the tenure of the contract (including extension of time, if any, (granted) and will not be subject to any fluctuation due to increase in cost of materials, labour, Taxes etc. unless specifically provided in these documents.

30. IDLE LABOUR

Whatever the reasons may be no claim for idle labour, additional establishment cost of hire and labour charges of tools and plants would be entertained under any circumstances.

31. SHOP DRAWINGS

The contractor shall prepare and get it approved by Consultant/ Architect before execution of the work.

32. ON COMPLETION SERVICES DRAWINGS

The drawings of services like plumbing, Sewerage, Telephone, Electrical, Fire Fighting etc. on completion of the work shall be prepared and submitted by the contractor in Triplicate. The final payment will be released subject to submission of the same

SECTION- VI

1.0 SPECIAL CONDITIONS FOR CEMENT AND STEEL

1.0.1. Cement, Steel (TMT Bars) and Structural steel will be procured by contractor.

1.0.2. The contractor shall also employ necessary watch and ward establishment for the safe custody of materials at his own cost.

1.1 STEEL

1.1.1 The standard sectional weights to be considered for conversion of length of various sizes of Mild Steel / CTD bars / TMT bars into weight are as under.

Dia in mm	Weight in Kg / Meter
6	0.222
8	0.395
10	0.617
12	0.888
16	1.580
18	2.000
20	2.470
22	2.980
25	3.850
28	4.830

1.1.2 The following procedure shall be adopted for payment of steel.

a. The standard sectional weights as indicated in para 1.1.1 shall be applicable for payment of steel bars above 6 mm dia for the works executed. The length measured at site shall be multiplied with the standard weights shown in 1.1.1 above to arrive at total weight of steel and the payment shall be made accordingly.

b. The payment for the work done will be on the basis of actual length, recorded in M.B multiplied by the standard weights given in para 1.1.1

1.1.3 The actual issue and consumption of steel on work shall be regulated and proper accounts maintained as provided in the contract. The theoretical consumption of steel shall be worked out as per procedure prescribed in the contract document elsewhere of the contract and shall be governed by conditions laid therein.

1.1.4 The steel reinforcement shall be stored by the contractor at site of work about 30cm. to 45 cm. above ground. A coat of cement wash shall be given to steel bars when stored at site for long

duration so as to prevent corrosion. Nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.

1.1.5 The Actual issue and consumption of steel on work shall be regulated and proper account maintained as provided in the contract. The theoretical consumption of steel shall be worked out as per procedure prescribed in the contract and shall be governed by conditions laid therein.

The actual issue of steel shall be actual weight of total quantity of Steel received at the site less actual weight of balance quantity of steel lying unutilized at the work site.

1.1.7 i) Reinforcement including authorized spacer bars and lap pages shall be measured in length of different diameters as actually (not more than as specified in the drawings) used in the work nearest to a centimeter. Wastage and unauthorized overlaps shall not be measured.

ii) The standard sectional weights referred in CPWD Specifications for works will be considered for conversion of length of various sizes of M.S. Bars, Tor Steel Bars and T.M.T. bars into Standard Weight.

1.2 CONDITIONS FOR CEMENT

1.2.1 The day to day actual issue / receipt and consumption of cement on work shall be regulated and proper accounts maintained as provided in the contract. The theoretical consumption of cement shall be worked out as per the procedure prescribed in the CPWD Delhi Schedule of Rates 2007 and shall be governed by conditions laid therein. If the quantity of cement actually used in the work is found to be more than the theoretical quantity of cement including authorized variation, nothing extra shall be payable to the contractor on this account. In the event of it being discovered that after completion of the work, the quantity of cement used is less than the quantity ascertained as herein before provided (allowing variation on minus side as stipulated in the contract), the cost of quantity of cement not so used shall be recovered from the contractor @ Rs. 5000/-(Rupees five thousand) only per metric tonne. Decision of Employer/Architect in regard to theoretical quantity of cement which should have been actually used as per the schedule and recovered at the rate specified, shall be final and binding on the contractor. For non-schedule items, the decision of the Employer/Architect regarding theoretical quantity of cement which should have been actually used, shall be final and binding on the contractor.

1.2.1.1 Cement brought to site and remaining unused after completion of work shall not be removed from site without written permission of the Employer/Architect

1.2.1.3 The contractor shall take all precautions to avoid accidents by exhibiting caution boards day and night. The contractor shall be responsible for all damages and accident due to negligence on his part.

1.2.1.4 No foreign exchange shall be made available by the Owner for the purchase of equipments, plants, machinery, material of any kind or other items required to be carried out in execution of work.

1.2.1.4 The contractor shall be bound to follow the instructions and restrictions imposed by the Administration / Police authorities on the working and / or movement of labour, materials etc.

and nothing extra shall be payable on this account or due to less / restricted working hours or any detours in movement of vehicles.

SECTION- VII

TESTING OF MATERIALS & BRIEF SPAECIFICATIONS

1.0 TESTING OF MATERIALS:

The contractors shall establish and maintain at their own cost in full working order a well equipped laboratory at site for the testing of all materials to be used in the work, the laboratory shall be accommodated in a secured, independent, temporary structure and shall be equipped with amongst other. The following testing equipment, (1) Compression testing machine (2) moulds (24 Nos.) sieves and jars, (3) Cones for slumps test, (4) Bins for storage of materials (5) Weigh balances with weights and measures (6) necessary gauges (7) Moisture meter etc. and all/ any other testing equipment desired by Employer or the Architect, necessary for testing the material. They shall in addition, employ at their own cost a qualified laboratory assistant-cum-laboratory supervisor responsible for undertaking the assistant-cum-laboratory supervisor responsible for undertaking the time at required intervals on the instructions of the Employer /Architect and shall maintain proper register and records of all tests carried out. The laboratory shall be under the control of the Employer so may at his discretion, get additional tests done as and when required. The contractor shall procure any other additional testing equipment at their cost as and when required by the Employer/ Architect, and carry out such other tests as may be instructed to do so. All tests shall be carried out as per the relevant norms and standards laid down for the testing of the material by the latest CPWD specifications and / or the latest ISI code of practice applicable therein. The laboratory equipment should be periodically got calibrated by the Contractor at their cost as required by the Employer/needful done at the risk & cost of the Contractor and recover the amount spent from the Contractor's bill. Material unable to be tested in the laboratory at site, shall be got tested from the Shriram Test House, Delhi. The Contractor shall also get Employer's cement and steel tested at his own cost, at regular intervals commensurate to supply, as and when directed by the Employer. In additional cement boiling test as per IS9013/78 to determine the accelerated compressive strength shall be carried out by the contractor as and when directed by the Employer determine the quality of cement received at site from each consignment.

2.0 BRIEF SPECIFICATION:

Brief specifications of the building has been described as follows:

BREIF SPECIFICATION

S.NO.	ITEM	DESCRIPTION
1.	**FOUNDATION**	RCC raft foundation has been designed for B+S+8 Storeyed structure.
2.	**SUPERSTRUCTURE**	Earthquake Resistant RCC frame structure with 9" thick outer wall & 4.5" thick internal partition wall made of burnt clay bricks.

3.DOOR WINDOWS FRAMES & SHUTTERS:

a) **Door/Window Frames:** All the door window frames will be of Malaysian salwood.

b) **Window shutters:** All wooden shutters of windows and ventilators in flats shall be of Ghana (Teak) wood.

c) **Door shutters:** All the shutters will be flush doors inside the flats but at main entrance the flush door will be one side teak veneered. Provision for MS jail and grill shutter at entrance.

4.**HARDWARE:** Aluminium anodized or powder coated fittings for all door/ windows & brass mortice lock shall be fixed at main entrance of flats.

5.**STEEL WORKS:** MS railing at balcony and passage shall be as per as sample approved by the Employer/ Architect.

6. **FLOORING WORKS:**

a) **Drawing & dining room:** Vitrified Tile of Approved Shade & make. (Not less than Rs 40/- per sqft)

b) **Bedrooms:** Vitrified Tile of Approved Shade & make. (Not less than Rs 40/- per sqft)

c) **Kitchen & Blaconies:** Rajnagar marble flooring (Range Rs. 45/- to 50/- per sqft.)

d) **Toilet:** Ceramic glazed tile of approved sample Rs 40/-

e) **Staircase & lift lobby:** Kota stone flooring.

7. **FINISH:**

a) **Entrance door:** Sprit polish

b) **Door/ window:** Enamel paint.

c) **Internal**: Plain cement plaster and Oil Bound Distemper in all the rooms.

d) **Ceiling:** White wash.

e) **External:** Acrylic Smooth Exterior Paint (as approved by the Society).

f) **Liftwall:** Pre-polished Granite stone (as approved by the Society).

8.**TOILETS:**

a) One toilet will have I.W.C. and others will have EWC.

b) Printed glazed tile Upto 7’-0” shall be provided in all toilets.

c) Provision for geyser/ hot water supply in each toilet.

d) CP fittings in each toilet as per approved make and sample.

e) Mixture shall be provided in master bedroom, toilet & kitchen) First class china wares shall be provided in each toilet.

9.**KITCHENS:**

a) Printed glazed tile upto 2’-6” above the kitchen counter and other wall upto the same level starting from floor level & walls below the kitchen sink.

b) Stainless steel kitchen sink with single bowl with drain board.

c) Black Granite stone slab shall be provided at the top of kitchen counter.

d) Geyser point shall be provided for hot water supply.

10. **SPECIFICATIONS FOR INTERNAL ELECTRICAL INSTALLATION:**

GENERAL AND TECHNICAL

NOTE :-The work has shall be done as per C.P.W.D. Specifications and Indian electricity board rule, I.S. specifications all the material shall be approved by Engineer-in-charge / secretary of the society.

1. POINT WIRING

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

a] Points for ceiling / exhaust fan points, pre-wired light fittings, and call bells.
b] Modular plate type switch with GI box and plate of specified make.
c] Point wiring proposed with 1.5 sq.mm PVC insulated copper conductor cable.

1.1 Scope

a] Control switch.
b] 3 pin or 6 pin socket.

1.2 Point wiring for socket outlet points

a] The light plug (6A/16A) point and power (15A / 16A) point wiring shall be complete with wiring, boxes, switches, and socket, loop earthling etc as required.

2. CIRCUIT AND SUBMAIN WIRING

2.1 Circuit Wiring and submain wiring.
Circuit wiring is inclusive of the part of wiring where are the sub main wiring shall be from the main board to meter board up to distribution board.

2.2 Submain wiring

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

2.3 Measurement of circuit and submain wiring

a] circuit and submain wiring shall be measured on linear basis along the run of the wiring. The measurement shall include all lengths from end conduit as the case may, exclusive on interconnections inside the switch board etc. The increase on account of diversion or slackness shall not be included in the measurement.

b] The length of circuit wiring with two wires shall be measured from the distribution board to the first nearest switch box in the circuit irrespective of whether the neutral conductor is taken to switchbox or not.

c] When circuit wires and wires of point wiring are run in same conduit/ circuit wiring shall be measured on linear basis depending on the actual number and sizes of wires run in the existing conduit.

d] Protective (loop earthing) conductors which are run along the circuit wiring and the submain wiring shall be measured on linear basis and paid for separately.

3. SYSTEM OF DISTRIBUTION AND WIRING

3.1 Distribution

a] Main distribution board shall be controlled by a circuit breaker or linked switch with fuse. Each outgoing circuit shall be controlled by a switch with fuse, circuit breaker or only a fuse on the phase or live conductor.

b] The branch distribution board shall be controlled by a linked switch fuse or circuit breaker. Each outgoing circuit shall be provided with a fuse or miniature circuit breaker (MCB) of specified rating on the phase or live conductor.

c] Triple pole distribution boards shall not be used for final circuit distribution, unless specific approval of the Engineer-in-charge is obtained. In such special cases, the triple pole distribution boards shall be of HRC fuse type or MCB type only.

d] The loads of the circuits shall be divided, as far as possible, evenly between the numbers of ways of the distribution boards, leaving at least one spare circuit for future extension.

e] 'Power' wiring shall be kept separate and distinct from 'Lighting' wiring, from the level of circuits i.e. beyond the branch distribution boards.

3.2 Wiring system

a] Unless and otherwise specified in the tender documents, wiring shall be done only by the "Looping system". Phase or live conductors shall be looped at the switch boxes and neutral conductors at the point outlets.

b] Lights, fans and call bells shall be wired in the 'lighting' circuits. 15A/ 16A socket outlets and other power outlets shall be wired in the 'Power' circuits. 5A/ 6A socket outlets shall be wired in the 'lighting' circuits in non residential buildings and in the 'power' circuit in residential buildings.

3.3 Passing through walls or floors

a] Where a wall pipe passes outside a building so as to be exposed to weather, the outer end shall be mounted and turned downwards and properly bused on the open end.

3.4 Joints in wiring

a] There shall be no joints in the through-runs of cables. If the length of final circuit or sub-main is more than the length of a standard coil, thus necessiting a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes.

b] Termination of multi-stranded conductors shall be done using suitable crimping type thimbles.

4. RATING OF OUTLETS (TO BE ADOPTED FOR DESIGN)

a] Ceiling fans shall be rated at 60 W. Exhaust fan, fluorescent tubes, compact fluorescent tubes, HPMV lamps, HPSV lamps etc. shall be rated according to their capacity. Control gear losses shall be also considered as applicable.

b] 5A / 6A and 15A / 16A socket outlet points shall be related at 100W and 1000W respectively, unless the actual values of loads are specified.

5. CAPACITY OF CIRCUITS:

a] "Lighting" circuit shall not have more than a total of 10 points of light, fan and socket outlets, or a total connected load of 800W, whichever is less.

b] "Power" circuit shall be designed with only one outlet per circuit in nonresidential buildings. The circuit shall be designed based on the load. Where not specified, the load shall be taken as 1 KW per outlet.

c] "Power" circuit in residential buildings shall be designed for not more than two outlets (15A/ 16A and / or 5A/ 6A) per circuit. The ratings for load calculation purposed shall however be taken as per the type of outlets.

d] Load more than 1 KW shall be controlled by an isolator or miniature circuit breaker.

6. WIRING ACCESSORIES

6.1 Control switches for points

a] Control switches of 15A/ 16A rating may preferably be only of modular type. If, however, modular type switch is used for controlling a socket outlet, combined switch cum socket shall not be permitted.

b] Power (15A/ 16A) outlets shall be controlled by single pole modular type switches or by MCB's, where specified. Only MCB's shall be used for controlling industrial type socket outlets, and power outlets above 1 KW.

6.2 Socket outlets

a] Socket outlets shall be of the same type, namely modular type, as their control switches. These shall be rated either for 5A/ 6A, or 15A/16A. Combined 5A/ 15A, or 6A/ 16A six pin socket outlet may be provided in 'power circuits only where specified.

b] Outlet boxes for socket outlets (both 15A/ 16A ands 5A/ 6A) points in residential buildings shall be of size 175mm x 100mm.

c] 5A/ 6A and 15A/ 16A socket outlets shall be installed at the following positions, unless otherwise specified.

i) Non-residential buildings - 23 cm above floor level.

ii) Kitchen - 23 cm above working platform and away from the likely positions of stove and sink.

iii) Bathroom - No socket outlet is permitted for connecting a portable appliance thereto. MCB / IC switch may be provided above 2.1m for fixed appliances, and at least 1 m away from shower.

7. MCB TYPE DISTRIBUTION BOARD (MCBDB)

a] MCB DB's may be of single phase, 3 phase (horizontal type) suitable for feeding single phase loads, or 3 phase (vertical type) suitable for feeding single phase as well as 3 phase loads, as specified. These shall be complete with accessories, but without MCB's which shall be specified as a separate item in the tender documents.

b] The current ratings and the number of ways shall be as specified. Blanking plates shall be provided to close unused ways. These shall be indicated as separate item in the Schedule of work.

8. PRE-WIRED MCB DISTRIBUTION BOARDS

a] The board shall also be provided with a loose wire box as a compartment for the complete width and, depth of the board, and of minimum height of 125mm in case of TPN DB's, and 100mm in case of SPN DB's.

b] The board shall be provided with a hinged cover of 1.6mm thick sheet steel in the front. Only the knobs of the MCB's shall protrude out of the front covers through openings neatly machine made for the purpose.

c] The board shall be complete with the following accessories:-

i) 200 A copper busbar (s).
ii) Neutral link.
iii) Common earth bar.
iv) DIN bar for mounting MCB's.
v) Elmex type terminal connectors suitable for incoming and outgoing cables.
vi) A set of indication lamps with HRC cartridge fuses for each phase of the incoming supply.
vii) Earthing stud.(s)

Note: - MCB's and blanking plates shall be specified as separate items, as required.

9. SWITCH BOARD INSTALLATION

a] Unless and otherwise specified in the tender documents, a switchboard shall not be installed so that its bottom is within 1.25 m above the floor.

b] There shall be a clear distance of 1 m in front of the switch boards. The space behind the switchboards shall be either less than 20 cm or more than 75 cm. If there are any attachments or bare connections at the back of the switch board. Rule 51 (c) of the Indian Electricity Rules shall apply.

c] Where it is required to terminate a number of conduits on a board. it may be convenient to provide a suitable MS adopter box for the purpose. Such boxes shall be provided with the prior approval of the Engineer-in-charge and this will be paid for separately.

d] No apparatus shall project beyond any edge of the panel. No fuse body shall be mounted within 2.5cm of any edge of the panel.

e] Busbars and interconnecting strips in fabricated boards shall be PVC tapped or sleeved in Red, Yellow and Blue for phases, and Black for neutral. The interconnecting cables shall also follow this colour coding.

10. ATTACHMENT OF FITTINGS AND ACCESSORIES

10.1 Conduit wiring system

a] All accessories like switches, socket outlets, call bell pushes and regulators shall be fixed in flush pattern inside the switch/ regulator boxes.

b] Aluminum alloy or cadmium plated iron screws shall be used to fix the accessories to their bases.

c] The switch box / regulator box shall normally be mounted with their bottom 1.25cm from floor level, unless otherwise directed by the Engineer-in-charge.

11. FIXING TO WALLS AND CEILING

a] Wooden plugs for ordinary walls or ceiling shall not be used in view of the ban on use of timber in Govt. works. However, where so specified, these shall be of well seasoned teak or other approved hard wood not less than 5 cm long by 2.5cm square on the inner end, and 2cm square on the outer end. They shall be cemented into walls within 6.5mm of the surface, the remainder being finished according to the nature of the surface with plasters or lime punning.

b] PVC sleeves/ dash fasteners should normally be used for fixing to walls or ceiling.

PVC CONDUIT WIRING SYSTEM

APPLICATION

a] Recessed conduit is suitable generally for all applications. Surface conduit work may be adopted in places like wiring above false ceiling / below false flooring, and at locations where recessed work may not be possible to be done. The type of work, viz. surface or recessed, shall be as specified in the respective works.

b] Flexible conduits may only be permitted for interconnections between switchgear, DB's and conduit terminations in wall

MATERIALS

Conduits

a] All rigid conduit pipes shall be of PVC and ISI marked. The wall thickness shall not be less than 1.6mm (16 SWG) for conduits up-to 32mm dia. and not less than 2mm (14 SWG) for conduits above 32mm dia.

b] No PVC conduit less than 20mm in diameter shall be used.

Conduit accessories

a] All conduit accessories shall be of solid type.

b] Saddles for surface conduit work on wall shall not be less than 0.55mm (24 gauge) for conduits upto 25mm dia. and not less than 0.9mm (20 gauge) for larger diameter. The corresponding widths shall be 19mm & 25mm.

Outlets

a] The switch box or regulator box shall be made of metal on all sides, except on the front. In the case of cast boxes, the wall thickness shall be at least 3mm and in case of welded mild steel sheet boxes, the wall thickness shall not be less than 1.2mm (18 gauge) for boxes upto a size of 20cm x 30cm, and above this size 1.6mm (16 gauge) thick MS boxes shall be used. The metallic boxes shall be duly painted with anticorrosive paint before erection as per chapter 10 of these specifications.

b] Outlet boxes shall be of one of the size, covered in the Schedule of Rates (Elect.), Part I-Internal- 1993.

c] Where a large number of control switches and/ or fan regulators are required to be installed at one place, these shall be installed in more than one outlet box adjacent to each other for ease of maintenance.

d] An earth terminal with stud and 2 metal washers shall be provided in each MS box for termination of protective conductors and for connection to socket outlet/ metallic body of fan regulator etc.

e] Clear depth of the box shall not be less than 50mm, and this shall be increased suitably to accordance mounting of fan regulators in flush pattern.

INSTALLATION

Common aspects for recessed and surface conduit works.

a] Bends in conduit

i) All necessary bends in the system, including diversion, shall be done either by neatly bending the pipes without cracking with a bending radius, or alternatively, by inserting suitable solid type normal bends or similar fittings, whichever is most suitable.

ii) No length of conduit shall have more than the equivalent of four quarter bends from outlet to outlet.

Additional requirements for surface conduit work.

a] Fixing conduit on surface

i) Conduit pipes shall be fixed by saddles, secured to suitable approved plugs with screws in an approved manner at an interval of not more than one metre, but on either side of the couplers or bends or similar fittings, saddles shall be fixed at a distance of 30 cm from the centre of such fittings.

b] Fixing outlet boxes

i) Only a portion of the switch box shall be sunk in the wall, the other portion being projected out for suitable entry of conduit pipes into the box.

Additional requirements for recessed conduit work

a] Fixing conduits in chase

i) The conduit pipe shall be fixed by means of J-hooks, or by means of saddles, not more than 60 cm apart, or by any other approved means of fixing.

ii) All joints of conduit pipes shall be treated with some approved preservative compound to secure protection against rust.

b] Fixing conduits in RCC work

i) The conduit pipes shall be laid in position and fixed to the steel reinforcement bars by steel binding wires before the concreting is done. The conduit pipes shall be fixed firmly to the steel reinforcement bars to avoid their dislocation during pouring of cement concrete and subsequent tamping of the same.

ii) Fixing of standard bends or elbows shall be avoided as far as practicable, and all curves shall be maintained by bending the conduit pipe itself with a long radius which will permit easy drawing in of conductors.

c] Fixing inspection boxes

i) Suitable inspection boxes to the minimum requirement shall be provided to permit inspection, and to facilitate replacement of wires, if necessary.

ii) These shall be mounted flush with the wall or ceiling concrete. Minimum 65mm depth junction boxes shall be used on roofslabs and the depth of the boxes in other places shall be as per IS: 2667 - 1977.

d] Fixing switch boxes and accessories

i) Switch boxes shall be mounted flush with the wall. All outlets such as switches, socket outlets etc. shall be flush mounting type, unless otherwise specified in the Additional Specifications.

e] Fish wire

i) To facilitate subsequent drawing of wires in the conduit, GI fish wire of 1.6mm / 1.2mm (16/ 18 SWG) shall be provided along with the laying of the recessed conduit.

TABLE - I

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

Clause 2.2 a]

Nominal Cross-Sectional Area of Conductor In sq.mm.	20mm		25mm		32mm		38mm	
	S	B	S	B	S	B	S	B

1	2	3	4	5	6	7	8	9								
1.50	5	4	10	8	18	12			-	-						
2.50	5	3	8	6	12	10			-	-						
4	3	2	6	5	10	8			-	-						
6	2	-	5	4			8	7			-	-				
10	2	-	4	3			6	5			8	6				
16	-	-			2	2			3	3			6	5		
25	-	-			-	-			3	2			5	3		
35	-	-			-	-	-	-			3	2				
50	-	-			-	-	-	-			-	-				
70	-	-			-	-	-	-			-	-				

EARTHING

8.0 SCOPE

This chapter covers the essential requirements of earthing system components and their installation. This shall be read with Appendix F, which lays down criteria for their design. For details not covered in these specifications IS code of Practice on Earthing (IS: 3043-1987) shall be referred to.

8.1 APPLICATION

(i) The electrical distribution system in the Department is with earthed neutral (i.e. neutral earthed at the transformer / generator end). In addition to the neutral earthing, provision is made for earthing the metallic body of equipments and non-current carrying metallic components in the sub-station, as well as in the internal/external electrical installations.

(ii) Earthing system is also required for lightning protection, computer installations and hospital operation theaters, etc. for functional reasons.

(iii) Earthing requirements are laid down in Indian Electricity Rules, 1956, as amended from time to time, and in the Regulations of the Electricity Supply Authority concerned. These shall be complied with.

(iv) Application for Internal E.I.

a) Every sub-main will have earth continuity conductor to run along with sub-main wiring. In case of 3-phase sub-main wiring two earth continuity conductors shall be provided.

b) Every circuit will have its earth continuity conductor to alongwith circuit wiring. In case of 3-phase sub-main wiring two earth continuity conductors shall be provided.

c) Looping of earth is allowed only in case of point wiring.

d) When 2/3 power outlets are looped to one circuit, earth looping of these outlets is permissible.

8.2 TYPES OF ELECTRONIC & MATERIAL

8.2.1 Earth Electrodes

8.2.1.1 Types

The type of earth electrode shall be any of the following, as specified. (For selection criteria in designs, Appendix F may be referred to).

(a) Pipe earth electrode.

(b) Plate earth electrode.

(c) Strip or conductor earth electrode.

8.2.1.2 Electrode materials and dimensions.

(i) The materials and minimum sizes of earth electrodes shall be as per Table IX.

(ii) GI pipe electrodes shall be cut tapered at the bottom, and provided with holes of 12mm dia, drilled not less than 7.5 cm from each other upto 2 m of length from the bottom.

(iii) The length of the buried strip or conductor earth electrode shall be not less than 15 m. This length shall suitably be increased if necessary, on the basis of the information available about soil resistance, so that the required earth resistance is obtained. Prior approval of the Engineer-in-charge shall be taken for any such increase in length.

(iv) All hardware items used for connecting the earthing conductor with the electrode shall be of GI in the case of GI pipe and GI plate earth electrodes, and forged tinned brass in case of copper plate electrodes.

8.2.2 Earthing Conductor & sizes

(i) The earthing conductor (protective conductor from earth electrode up to the main earthing terminal/earth bus, as the case may be) shall be of the same material as the electrode, viz. GI or copper, and in the form of wire or strip as specified.

(ii) The size of earthing conductor shall be specified, but this shall not be less than the following (For calculating the size of the earthing conductor in design, Appendix F para 3.5.1).

(a) 4mm dia. (8 SWG) copper wire.
(b) 25mm x 4mm in the case of GI strip, or,
(c) 20 mm x 3mm in the case of copper strip.

(iii) Earthing conductor larger than the following sectional areas need not be used, unless otherwise specified.

(a) 150 sq.mm. in case of GI, or,
(b) 100 sq.mm. in case of copper.

8.2.3 Earth continuity / loop earthing conductor & sizes

(i) The material and size of protective conductors shall be as specified Below (for criteria in design of these appendix F may be referred to):

Size Phase Conductor	Size of protective conductor of the same material as phase conductor
Upto 4 sq.mm	4 sq.mm.
Above 4 sq.mm up to 16 sq.mm.	Same size as phase conductor
Above 16 sq.mm up to 35 sq.mm.	16 sq.mm.
Above 35 sq.mm.	Half of the phase conductor

8.3 LOCATION FOR EARTH ELECTRODES

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

(ii) The location of the earth electrode will be such that the soil has a reasonable chance of remaining moist as far as possible. Entrances, pavements and roadways, should be avoided for locating earth electrodes.

8.4 INSTALLATION

8.4.1 Electrodes

8.4.1.1 Various types of electrodes

(i) (a) Pipe electrode shall be buried in the ground vertically with its top at not less than 20 cm below the ground level. The installation shall be carried out as shown in Fig. 11.

(b) In locations where the full length of pipe electrode is not possible to be installed due to meeting a water table, hard soil or rock, the electrode may be to reduced length, provided the required earth resistance result is achieved with or without additional electrodes, or any alternative method of earthing may be adopted, with the prior approval of the Engineer-in-charge. Pipe electrodes may also be installed in horizontal formation in such exceptional cases.

(ii) Plate electrode shall be buried in ground with its faces vertical, and its top not less than 1.5 m below the ground level. The installation shall be carried

(iii) When more than one electrode (plate/pipe) is to be installed, a separation of not less than 2 m shall be maintained between two adjacent electrodes.

(iv) (a) The strip or conductor electrode shall be buried in trench not less than 0.5 m deep.

(b) If conditions necessitate the use of more than one strip or conductor electrode, they shall be laid as widely distributed as possible, in a single straight trench where feasible, or preferably in a number of trenches radiating from one point.

(c) If the electrode cannot be laid in a straight length, it may be laid in a zigzag manner with a deviation upto 45 degrees from the axis of the strip. IT can also be laid in the form of an arc with curvature more than 1 m or a polygon.

8.4.1.2. Artificial treatment of soil

When artificial treatment of soil is to be resorted to, the same shall be specified in the schedule of work. The electrode shall be surrounded by charcoal / coke and salt as indicated in Fig. 11 and 12. In such cases, excavation for earth electrode shall be increased as per the dimensions indicated in these figures.

8.4.1.3 Watering arrangement

(i) In the case of plate earth electrodes, a watering pipe 20 mm dia.
Medium class pipe shall be provided and attached to the
electrodes as shown in Fig. 9 and 10. A funnel with mesh shall be provided on the top of this pipe for watering the earth.

(ii) In the case of pipe electrodes, a 40 mm x 20 mm reducer shall be used for fixing the funnel with mesh.

(iii) The watering funnel attachment shall be housed in a masonry enclosure of size not less than 30 cm to 30 cm x 30 cm.

(v) A cast iron / MS frame with MS cover, 6mm thick, and having locking arrangement shall be suitably embedded in the masonry enclosure.

8.4.2 Earthing conductor (Main earthing lead)

(i) In the case of plate earth electrode, the earthing conductor shall be secured as indicated in fig. 11 using a through bolt, nuts and washers and terminating socket.

(ii) In the case of pipe earth electrode, the earthing conductor shall be securely terminated on to the plate with two bolts, nuts and washers and terminating socket.

(iii) A double C-clamp arrangement shall be provided for terminating tape type earthing conductor with GI watering pipe coupled to the pipe earth electrode. Galvanized “C” shaped strips, bolts, washers, nuts and check nuts of adequate size shall be used for the purpose.

(iv) The earthing conductor from the electrode up to the building shall be protected from mechanical injury by a medium class, 15mm dia. GI pipe in the case of wire, and by 40mm dia, medium class GI pipe in the case of strip. The protection pipe in ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floors to adequate depth in due co-ordination with the building work.

(v) The earthing conductor shall be securely connected at the other end to the earth stud/earth bar provided on the switch board by:
   (a) Soldered or preferably crimped lug, bolt, nut and washer in the case of wire, and
   (b) Bolt, nut and washer in case of strip conductor.

In the case of substations or alternators, the termination shall be made on the earthing terminal of the neutral point on the equipment and/or the earth bus, as the case may be.

8.4.3 Loop Earthing/Earth continuity Conductor

(i) Earth terminal of every switchboard in the distribution system shall be bonded to the earth bar/terminal of the upstream switch board by protective conductor(s).

(ii) Two protective conductors shall be provided for a switchboard carrying a 3-phase switchgear thereon.

(iii) Loop earthing of individual units will not be however necessary in the case of cubicle type switchboards.

(iv) The earth connector in every distribution board (DB) shall be securely connected to the earth stud/earth bar of the corresponding switch board by a protective conductor.

(vi) The earth pin of socket outlets as well as metallic body of fan regulators shall be connected to the earth stud in switch boxes by protective conductor. Where the switch boxes are of non-metallic type, these shall be looped at the socket earth terminals, or at an independent screwed connector inside the switch box. Twisted earth connections shall not be accepted in any case.

8.5 EARTH RESISTANCE

(i) The earth resistance at each electrode shall be measured. No earth electrode shall have a greater ohmic resistance than 5 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be up to 8 ohms.

(ii) Where the above stated earth resistance is not achieved, necessary improvement shall be made by additional provisions, such as additional electrode (s), different type of electrode, or artificial chemical treatment of soil etc., as may be directed by the Engineer-in-Charge.

8.6 MARKING

(i) Earth bars/terminals at all switch boards shall be marked permanently, either as “E” or as

(ii) Main earthing terminal shall be marked “SAFETY EARTH – DO NOT DISCONNECT”.

8.7 USE OF RESIDUAL CURRENT DEVICES (RDCs)

An extract on selection and application of RCDs (also known as RCCBs) from IS: 12640-1988 is given at Appendix G. Provision of RCD shall be specified in individual cases keeping in view the type, use, importance, system of earthing and nature of electrical installations to be protected by the RCCBs, requirements of the local electric supply company, etc. The sensitivity shall be 30mA, 100mA, 300mA, or 500mA, as specified.

TABLE IX

Materials and sizes of earth electrodes

[Clause 8.2.1.2 (i)]

Type of Electrode	Material	Size
Pipe	GI medium class	40mm dia

		3.45m long (Without any joint)
Plate	(i) GI (ii) Copper	60 cm x 60 cm x 6 mm thick 60 cm x 60 cm x 3 mm thick
Strip	(i) GI (ii) Copper	100 sq.mm section 40 sq.mm section
Conductor	(i) Copper	4mm dia (8 SWG)

Note: Galvanization of GI items shall conform to Class IV of IS: 4736-1986.

PROTECTION OF BUILDING AGAINST LIGHTNING

9.0 SCOPE

This chapter covers the detailed requirements of installation of lightning conductor system for protection of buildings against lighting. The principles of this type of protection are outlined in Appendix I to these Specifications. For details not covered in these specifications, reference may be made to IS: 2309-1989.

9.1 APPLICATION

This system shall be provided where specified. The decision whether or not to provide this system should be taken by the competent authority considering all relevant factors as per Appendix I.

9.2 PRINCIPAL COMPONENTS

The principal components of a lightning protective system are :-

a) Air terminations,
b) Down conductors,
c) Joint and bonds,
d) Testing joints,
e) Earth terminations, and
f) Earth electrodes.

9.3 MATERIALS

9.3.1 The materials of air terminations, down conductors, earth termination etc. of the protective system shall be reliably resistant to corrosion, or be adequately protected against corrosion. The material shall be one of the following, as specified.

(a) Copper: Solid or flat copper strip of at least 98% conductivity conforming to relevant I.S. Specifications shall be used.

(b) Copper Clad Steel: Copper clad steel with copper covering permanently and effectively welded to the steel core shall be used. The proportion of copper and steel shall be such that the conductance of the material is not less than 30% of conductance of the solid copper of the same total cross-sectional area.

(c) Galvanized Steel: Steel thoroughly protected against corrosion by a zinc coating shall be used.

(d) Aluminium: Aluminium, 99% pure, and with sufficient mechanical strength, and protected against corrosion shall be used.

9.3.2 Aluminium should not be used underground, or in direct contact with walls.

9.3.3 All air terminations shall be of GI and all down conductors shall be of GI or aluminium, except where the atmospheric conditions necessitate the use of copper or copper clad steel for air terminations and down conductors.

9.3.4 The recommended shape and minimum sizes of conductors for use above and below ground are given in Tables X and XI respectively.

9.4 LAYOUT

9.4.1. The system design and layout shall be done in accordance with IS: 2309-1989 and specified in the tender documents. The work shall be carried out accordingly satisfying at the same time, the requirements of clauses 8.4.2 to 8.4.3.

9.4.2. Air terminations:

(i) Air termination networks may consist of vertical or horizontal conductors, or combinations of both. For the purpose of lightning protection, the vertical and horizontal conductors are considered equivalent and the use of pointed air terminations, or vertical finial is, therefore, not regarded as essential.

(ii) A vertical air termination, where provided, need not have more than one point, and shall project at least 30 cm, above the object, salient point or network on which it is fixed.

(iii) For a flat roof, horizontal air termination along the outer perimeter of the roof shall project at least 30 cm, above the object, salient point or network on which it is fixed.

(iv) Horizontal air terminations should be carried along the contours such as ridges, parapets and edges of flat roofs, and, where necessary, over flat surfaces, in such a way as to join each air termination to the rest, and should themselves form a closed network.

(v) All metallic projections including reinforcement, on or above the main surface of the roof which are connected to the general mass of the earth, should be bonded to the down conductors of the taller portions, in addition to their own down conductors.

(vi) If portions of a structure vary considerably in height, any necessary air terminations or air termination network for the lower portions should be bonded to the down conductors of the taller portions.

9.4.3 Down Conductors

(i) The number and spacing of down conductors shall be as specified, or as directed by the Engineer-in-charge.

(ii) Routing

(a) A down conductor should follow the most direct path possible between the air terminal network and the earth termination network. Where more than one down conductor is used, the conductors should be arranged as evenly as practicable around the outside walls of the structures.

(b) The walls of light wells may be used for fixing down conductors, but lift shafts should not be used for this purpose.

(c) Metal pipes leading rainwater from the roof to the ground may be connected to the down conductors, but cannot replace them, such connections should have disconnecting joints.

(d) In deciding on the routing of the down conductor, its accessibility for inspection, testing and maintenance should be taken into consideration.

(iii) Provision when external route is not available.

(a) Where the provision of external routes foe down conductors is impracticable, for example, in buildings of cantilever construction from the first floor upwards, down conductors should not follow the outside contours of the building. To do so would create a hazard to persons standing under the over hang. In such cases, the down conductors may be housed in an air space provided by a nonmetallic and non-combustible internal duct and taken straight down to the ground.

(b) Any suitable covered recess, not smaller than 76 mm x 13 mm, or any suitable vertical service duct running the full height of the building may be used for this purpose, provided it does not contain an unarmored or a non-metal sheathed cable.

(c) In cases where an unrestricted duct is used, seals at each floor level may be required for fire protection. As far as possible, access to the interior of the duct should be available.

9.4.4 The lightning protective system should be so installed that it does not spoil the architectural or aesthetic beauty of the buildings.

9.5 INSTALLATION

9.5.1 General

(i) The entire lightning protective system should be mechanically strong to withstand the mechanical forces produced in the event of a lightning strike.

(ii) Conductors shall be securely attached to the building, or other object to be protected by fasteners, which shall be substantial in construction, not subject to breakage, and shall be of galvanized steel or other suitable materials, with suitable precautions to avoid corrosion.

(iii) The lightning conductors shall be secured not more than 1.2 m apart for horizontal run, and 1 m for vertical run.

9.5.2 Air Terminations

All air terminals shall be effectively secured against overturning either by attachment to the object to be protected, or by means of substantial bracings and fixings which shall be permanently and rigidly attached to the building. The method and nature of the fixings should be simple, solid and permanent, due attention being given to the climatic conditions and possible corrosion.

9.5.3 Down Conductors

(i) The down conductor system must, where practicable, be directly routed from the air termination to the earth termination network, and as far as possible, be symmetrically placed around the outside walls of the structure starting from the corners. In all cases consideration to side flashing must always be given.

(ii) (a) Practical reasons may not sometimes allow the most direct route be followed. While sharp bends, such as arise at the end of roof are in escapable (and hence permissible), re-entrant loops in a conductor can produce high inductive voltage drops so that the lightning discharge may jump across the open side of a loop. As a rough guide, this risk may arise when the length of the conductor forming the loop exceeds 8 times the width of the open side of the loop.

(b) When large re-entrant loops as defined above cannot be avoided, such as in the case of some cornices or parapets, the conductors should be arranged in such a way that the distance across the open side of a loop complies with the requirement indicated above. Alternatively, such cornices or parapets should be provided with holes through which the conductor can pass freely.

(iii) Bonding to prevent side flashing

Any metal in, or forming a part of the structure, or any building services having metallic parts which are in contact with the general mass of the earth, should be either isolated from, or bonded to the down conductor. This also applies to all exposed large metal items having any dimension greater than 2 m whether connected to the earth or not.

9.5.4. Joints and bonds

9.5.4.1 Joints

(i) A lightning protective system should have as few joints as possible.

(ii) Joints should be mechanically and electrically effective, for example, clamped, screwed, bolted, crimped, riveted or welded.

(iii) With overlapping joints, the length of the overlap should not be less than 20 mm for all types of conductors.

(iv) Contact surfaces should first be cleaned, and then inhibited from oxidation with a suitable non-corrosive compound.

(v) Joints of dissimilar metals should be protected against corrosion or erosion from the elements, or the environment and should present an adequate contact area.

9.5.4.2 Bonds

(i) Bonds have to join a variety of metallic parts of different shapes and composition, and cannot therefore be of a standard form.

(ii) There is the constant problem of corrosion and careful attention must be given to the metals involved, i.e. the metal form which the bond is made, and those of the items being bonded.

(iii) The bond must be mechanically and electrically effective, and protected from corrosion in, and erosion by the operating environment.

(iv) External metal on, or forming part of a structure, may have to discharge the full lightning current, and its bond to the lightning protective system should have a cross sectional area not less than that employed for the main conductors.

(v) Structures supporting overhead electric supply, telephone and other lines must not be bonded to a lightning protective system without the permission of the appropriate authority.

(vi) Gas pipe in no case shall be bonded to the lightning protective earth termination system.

9.5.5. Test joints

Each down conductor should be provided with a test joint in such a position that, while not inviting unauthorized interference, it is convenient for use when testing.

9.5.6 Earth termination network

(i) An earth station comprising one or more earth electrodes as required, should be connected to each down conductor. This shall be specified.

(ii) Each of the earth stations should have a resistance not exceeding the product given by 10 ohms multiplied by the number of earth electrodes to be provided therein. The whole of the lightning protective system, including any ring earth, should have a combined resistance to earth not exceeding 10 ohms, a reductioncan be achieved by extending or adding to the electrodes, or by
interconnecting the individual earth terminations of the down conductors by a conductor installed below ground, sometimes referred to as a ring conductor. Buried ring conductors laid in this manner are considered to be an integral part of the earth termination network, and should be taken into account when assessing the overall value of resistance to earth of the installation.

(iii) If the value obtained for the whole of the lightning protection system exceeds 10 ohms, a reduction can be achieved by extending or adding to the electrodes, or by interconnecting the individual earth terminations of the down conductors by a conductor installed below ground, sometimes referred to as a ring conductor. Buried ring conductors laid in this manner are considered to be an integral part of the earth termination network, and should be taken into account when assessing the overall value of resistance to earth of the installation.

(iv) A reduction of the resistance to the earth to a value below 10 ohms has the advantage of further reducing the potential gradient around the earth electrodes when discharging lightning current. IT also further reduces the risk of side flashing to metal in, or of structure.

(v) Earth electrodes should be capable of being isolated and a reference earth point should be provided for testing purposes.

TESTING OF INSTALLATION SCOPE

This chapter describes the details of tests to be conducted in the completed internal electrical installations, before commissioning.

GENERAL Tests

On completion of installation, the following tests shall be carried out : -

1) Insulation resistance test.

2) Polarity test of switch.
3) Earth continuity test.
4) Earth electrode resistance test.

Witnessing of tests
Testing shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer-in-charge by the contractor. All test results shall be recorded and submitted to the Department.

Test instruments
All necessary test instruments for the test shall be arranged by the contractor if so required by the Engineer-in-charge.

INSULATION RESISTANCE

The insulation resistance shall be measured by applying between earth and the whole system of conductors, or any section thereof with all fuses in place, and all switches closed, and except in 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 it need not exceed 500 volts for medium voltage circuits. Where the supply is derived from a three wire D.C., or a polyphase A.C. system, the neutral pole of which is connected to earth either directly or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

The insulation resistance shall also be measured between all the conductors connected 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 the lamps in position and switches in "off" position, and its value shall be not less than that specified in sub-clause. The insulation resistance in mega ohms measured as above shall not be less than 12.5 mega ohms for the wiring with PVC insulated cables, subject to a minimum of 1 mega ohms. Where a whole installation is being tested, a lower value than that given by the formula, subject to a minimum of 1 mega ohm, is acceptable. A preliminary and similar test may be made before the lamps etc. are installed, and in this event the insulation resistance to earth should not be less than 25 megs ohms for the wiring with PVC insulated cables, subject to a minimum of 2 mega ohms. The term "outlet" includes every point along with every switch, except that a switch combined with a socket outlet, appliance or lighting fitting is regarded as one outlet. Control rheostats, heating and power appliances and electric signs 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 Specifications, or where there is no such Specification, shall be not less than one mega ohm.

POLARITY TEST OF SWITCH

In a two wire installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor throughout, and such conductor shall be labeled or marked for connection to the phase conductor, or to the non-earthed conductors of the supply. In a three wire or a four wire installation, a test shall be made to verify that every non-linked single pole switch in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply. 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.

TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor, including metal conduits and metallic envelopes of cables in all cases, shall be tested for electric continuity. The electrical resistance of the same alongwith 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.

MEASURMENT OF EARTH ELECTRODE RESISTANCE

Two auxiliary earth electrode, besides the test electrode, are placed at suitable distance from the test electrode (see figure 14). A measure current is passed between the electrode 'A' to be tested and an auxiliary current electrode 'C', and the potential difference between the electrode 'A' and auxiliary potential 'B' is measured. The resistance of the test electrode 'A' is then given by:

$$R = \frac{V}{I}$$

Where,

R - Resistance of the test electrode in ohms,

V - Reading of the voltmeter in volts.

I - Reading of the ammeter in amps.

(i) Stray currents flowing in the soil may produce serious errors in the measurement of earth resistance. To eliminate this, hand driven generator is used.

(ii) If the frequency of the supply of hand driven generator coincides with the frequency of stray current, there will be wandering of instrument pointer. An increase or decrease of generator speed will cause this to disappear.

At the time of test, the test electrode shall be separated from the earthing system.

The auxiliary electrodes shall be of 13 mm diameter mild steel rod driven upto 1 mm into the ground. All the three electrodes shall be so placed that they are independent of the resistance area of each other. IF the test electrode is in the form of a rod, pipe or plate, the auxiliary current electrode 'C' shall be placed at least 30 m away from it, and the auxiliary potential electrode 'B' shall be placed mid-way between them. Unless three consecutive readings of test electrode resistance agree, the test shall be repeated by increasing the distance between electrodes A and C upto 50 m, and each time placing the electrode B midway between them. On these principles, "Megger Earth Tester", containing a direct reading ohm-meter, a hand driven generator and auxiliary electrodes are manufactured for direct reading of earth resistance of electrode.

TESTING CERTIFICATE

On completion of an electrical installation (or an extension to an installation), 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 'E' in addition to the test certificate required by the local Electric Supply Authorities.

11. **WATER SUPPLY AND DRAINAGE:**

a) An underground water storage tank shall be provided for all the blocks. Each block shall have an PVC overhead tank @1000 Lt per flat & a RCC Tank of 20000 Lts. For fire fighting purpose which shall be connected to the underground water tank through the booster pumps to have regular water supply.

b) CI/ PVC pipe to be used for soil/waste and rain water pipes.

12. **WATER PROOFING:**

a) **Sunken Areas:** Plain neat cement plaster with water proofing liquid compound.

b) **Under Ground Water Tanks:** Red stone water proofing / pressure grouting shall be done as per specifications and details.

13. **BOUNDARY WALL/ GRILLS & GATES:**

All railings/grills/gates shall be with kharad (Cast Iron) Bhallas.

GENERAL CONDITIONS OF CONTRACT

1. The work will be executed according to the drawings to be released as GOOD FOR CONSTRUCTION from time to time by the Principal, I.P. College and according to any additions/modifications/deletions made from time to time, as required by any other drawings that would be issued to the contractor progressively during executive of work.
2. The quantities of various items as entered in the BILL OF QUANTITIES are indicative only and may vary depending upon the actual requirement. The contractor shall be bound to carry out and complete the stipulated work irrespective of the variation in individual items specified in the bill of quantities.
3. The security deposit or the retention money shall be deducted from each running bill of the contractor at 5% of the gross value of the Running Account bill. The security deposit or retention money shall be refunded to the contractor after successful completion of work.
4. It shall be entirely the contractor's responsibility to provide, operate and maintain all necessary construction equipments, scaffoldings and safety, gadget, lifting tackles, tools and appliances to perform the work in a workman like and efficient manner and complete all jobs as per the specifications and within the scheduled time of completion of work.
5. It is mandatory for the contractor to provide safety equipments and gadgets to its all workers, supervisory and Technical staff engaged in the execution of the work while working. The minimum requirement shall be gum boots, safety helmets, rubber hand gloves, face masks, safety nets, belts, goggles etc. as per work requirements. The cost of the above equipments,/gadgets are deemed to be included in the rates quoted by the contractor for the items & works as per Bill of Quantities and contractor shall not be entitled for any extra cost in these regards. The above norm is to be strictly complied with at site. In case the contractor is found to be deficient in providing safety Equipments/gadgets in the opinion of the Principal, I.P. College, at his option can procure the same at the risk & cost of contractor an provide the same for the use of worksite and shall make the recoveries from the bills of the contractor for the same. The decision of the Principal, I. P. College shall be final and binding on contractor in this regard.
6. One copy of contract documents including drawings furnished to the contractor shall be kept at the site and the same shall at all reasonable times be available for inspection.
7. Income tax deductions shall be made from all payments made to the contractor including advance against work done, as per the rules and regulations in force in accordance with the Income tax act prevailing from time to time.
8. The rates are inclusive of Turnover Tax/sales Tax on Works Contract payable of State Govt. along with other taxes, duties, levies etc. in conjunction with other terms and conditions. In case, the Turnover Tax/sales Tax on Works Contract on execution of works is waived off by the State Govt. at later stage for this project, the equivalents amount from the date of waiver of such tax shall be deducted from the amount payable to the contractor from subsequent RA bills.
9. The rates quoted by the tender shall firm and fixed for the entire period of completion and till handing over of the work. No revision to rates or any escalation shall be allowed on account of any increase in prices of materials, labour. POL and Overheads etc or nay the statutory increase during the entire contract period or extended contract period.
10. The contractor shall be deemed to have inspected the site, its surrounding and acquitted itself with the nature of the ground accessibility of the site and full extent and nature of all operations necessary for the full and proper execution of the contract, space for the storage of materials, constructional plant, temporary works, restrictions on the plying of heavy vehicles in area, supply and use of labour, materials, plant, equipment and laws, rules and regulations, if any imposed by the local authorities.
11. The rates and prices to be tendered in the bill of quantities are for completed and finished items of works and complete in all respects. It will be deemed to include all constructional plant, labour, supervision, materials, transport, all temporary works erection, maintenance, contractor's profit and establishment/overheads, together with preparation of designs k& drawings pertaining to casting yard, shop drawing, staging form work, stacking yard etc. all general risk, taxes, royalty,

duties, cess, octroi and other levies, insurance liabilities and obligations set out or implied in the tender documents and contract.

12. No Claim on account of any price variation/Escalation on whatsoever ground shall be entertained at any stage of works. All rates as per bill of quantities(BOQ) quoted by Contractor shall be firm and fixed for entire contract period as well as extended period for completion of the works. No escalation/price variation clause shall be applicable on this contract.
13. The Contractor shall obtain a valid license under the contract labour act 1970 and the contract labour Act Central Rules 1971 and amended from time to time and continue to have a valid license until the completion of the works including defect liability period. The Contractor shall also abide by the provision of the child labour Act 1986 and amended from time to time. Any failure to fulfill this requirement shall attract the penal provisions of this contract arising out the resultant for non execution of the work before the commencement of work.
14. No labour below the age of 18 years shall be employed on the work. If there is any violation then the contract will be terminated. No labour will stay in the college premises after performing his daily work.
15. The Contractor shall at his own cost take all precautions to ensure safety of life and property by providing necessary barriers, lights, watchman etc. during the progress of work as directed by the Principal, College.
16. In case of all labour directly or indirectly employee din work for the performance on the contractor's part of this contract, the contractor shall comply with all rules framed by Govt. from time to time for the protection of health and sanitary arrangements for workers.
17. Interest free secured advance up to a maximum of 75% of rate of item or market cost of material whichever is less, required for incorporation in the permanent work and brought to site and shall be paid to Contractor for all non-perishable items. The advance shall be recovered in full from next running account bill and fresh advance paid for the balance quantities of materials. The Contractor shall construct suitable god own at site of work for safe storing the materials against any possible damages due to sun, rain, dampness, fire, theft etc. at his own cost. He shall also employ necessary watch & ward establishment for the purpose at his costs and risks. Such secured advance shall be payable on the other items of perishable nature, fragile, land combustible with approval of the Principal, I. P. College provided the contractor provides a comprehensive insurance cover for the full cost of such materials . The decision of the Principal, I.P. College shall be final and binding on the contractor in this matter. No secured advance shall however be paid on high risk materials such as ordinary glass, sand , petrol, diesel etc.
18. Unless otherwise mentioned in the bill of quantities the measurements of works shall be done as per MOST/CPWD specifications and if the same is not given in the MOST/CPWD specifications, the same shall be measured as per latest relevant BIS codes in force.
19. PAYMENTS

1) 75% payment of value of material shall be released on receipt of material at site.
2) Contractor has to submit R.A. Bill any 15 days against work done payment up to 95% shall be released to contractor within seven days . I t might work is to be done for any reason. All arrangements for lighting shall be done by the contractor. Only male labour shall be employed for sight work if any.
3) Final bill shall be submitted by Contractor on completion of work and after checking by I.P. College payment up to 95% shall be released within seven days.
4) 5% of the cost of these terms would be returned as guarantee to the reference of the work done.

20. PERIOD FOR COMPLETION

The entire work is to be completed within forty five days after receipt of work order

21. COMPENSTION FOR DELAY AND REMEDIES

If the Contractor fails to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the law on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below or such smaller amount as the Principal, I.P. College may decide on the amount of contract value of the work for every completed day/week that the work remains incomplete.

Completion period (as originally stipulated) @ 1% per week

Provided always that the total amount of compensation for delay to the paid under this condition shall not exceed 10% of the contract value of work.

22. It is specifically and distinctly understood and agreed between the I.P. COLLEGE and the contractor that the contractor shall have no right, title or interest in the site made available by the I. P. COLLEGE for execution of the works or in the building, structures or works executed on the said site by the contractor or in the goods, articles, materials etc. brought on the said site (unless the same specifically belongs to the contractor) and the contractor shall not have or deemed to have any lien whatsoever charge for unpaid bills will not be entitled to assume or retain possession or control of the site or structures and the I.P. COLLEGE shall have an absolute and unfettered right to take full possession of site and to remove the contractor, their servants, agents and materials belonging to the contractor and lying on the site

23. No part of the contract shall be sublet without written permission of I.P. COLLEGE. Nor shall transfer to made authorizing others to receive payment on contractors behalf .

24. The contract shall be responsible for payment of minimum wages, EPF, ESI, Bonus , workman compensation etc. as per relevant acts and rules. Necessary records hall be kept in compliance of the same and for verification by enfacing agencies and I. P. COLLEGE. Final clearance of contractors bill will be made after full satisfaction of I.P. College that all statutory dues and all dues to labor have been cleared.

25. The contractor shall clean the site thoroughly of all scaffolding, materials and rubbish etc. left of his wok and clean the site around his place of work to the satisfaction of I. P. COLLEGE before the work is considered complete.

26. All expenditure incurred towards use of electricity provided by I.P. COLLEGE shall be reimbursed by the contractor a deducted from his bill

27 The specifications and mode of measurements for Civil works shall be in accordance with C.P.W.D.specifications 1996 Volumes I to VI. Unless otherwise specified in the nomenclature of individual item or in the specifications, the entire work shall be carried out as per the C.P.W.D. specifications with upto date correction slips upto the date of opening of tender.

28 For the item not covered under CPWD Specifications mentioned above, the work shall be executed as per latest relevant standards/codes published by B.I.S. (formerly lSI) inclusive of all amendments issued thereto or revision thereof, if
any, upto the date of opening of tenders.

29. In case of B.I.S. (formerly I.S.I) codes/specifications are not available, the decision of the Principal based on acceptable sound engineering practice and local usage shall be final and binding on the contractor.

1.04 However, in the event of any discrepancy in the description of any item as given in the schedule of quantities or specifications appended with the tender and the specifications relating to the relevant item as per CPWD specifications mentioned above, or in drawings the former shall

prevail.

1.06 The work shall be carried out in accordance with the architectural, structural and electrical drawings etc. The drawings shall have to be properly co-related before executing the work. In case of any difference noticed between the drawings, final decision, in writing of the Principal shall be obtained by the contractor. For items where so required, samples shall be prepared before starting the particular items of work for prior approval of the Engineer and nothing extra shall be payable on this account.

1.07 All materials to be used on works shall bear I.S. certification mark unless specifically permitted otherwise in writing. In case I.S. marked materials are not
available (not produced), the materials used shall conform to I.S. code or CPWD specifications as applicable in this contract.

In such cases the Principal satisfy himself about the quality of such materials and give his approval in writing. Only articles classified as "First Quality" by the manufacturers shall be used unless otherwise specified. All materials shall be tested as per provisions on the Mandatory Tests in CPWD specifications and the relevant IS specifications. The Principal may relax the condition regarding testing if the quantity of materials required for the work is small. Proper proof of procurement of materials from authentic manufacturers shall be provided by the contractor to the satisfaction of Engineer. Grade of cement used shall be 43 unless otherwise specified explicitly. The contractor shall get the Design Mix for RCC done by the labs approved by HSCC only. Reinforcement Steel used shall be of FE-415 unless otherwise specified.

1.08 In respect of the work of the sub-agencies deployed for doing work of electrification, external services, other building work, horticulture work, etc. for this project and any other agencies simultaneously executing other works, the contractor shall afford necessary coordination and facilities for the same. The contractor shall leave such necessary holes, openings, etc. for laying / burrying in the work pipes, and nothing extra over the agreement rates shall be paid.

1.09 Unless otherwise specified in the bill of quantities, the rates for all items of work shall be considered as inclusive of pumping out or bailing out water if required for which no extra payment will be made. This will include water encountered from any source such as rains, floods, subsoil water table being high or due to any other cause whatsoever.

1.10 Any cement slurry added over base surface (or) for continuation of concreting for bond is added its cost is deemed to have in built in the item unless otherwise/explicitly stated and nothing extra shall be payable or extra cement considered with consumption on this account.

1.11 The rate for all items in which the use of cement is involved is inclusive of charges for curing.

1.12 The contractor shall clear the site thoroughly of all scaffolding materials and rubbish etc. left out of his work and dress the site around the building to the satisfaction of the Engineer before the work is considered as complete.

1.13 Rates for plastering work (excluding washed grit finish on external wall surfaces) shall include for making grooves, bands etc. wherever required and nothing extra shall be paid for the same.

1.14 The rates quoted for all brick/concrete work shall be deemed to include making openings and making good these with the same specifications as shown in drawings and/or as directed. No extra payment shall be made to the contractor on this account.

1.15 Rates for all concrete/plaster work shall include for making drip course moulding, grooves etc. wherever required and nothing extra shall be paid for the same.

1.16 The drawing(s) attached with the tender documents are for the purpose of tender only, giving the tenderer a general idea of the nature and the extent of works to be executed. The rates quoted by the tenderer shall be deemed to be for the execution of works taking into account the "Design Aspect" of the items and in accordance with the "Construction Drawings" to be supplied to the Contractor during execution of the works.

1.17 The quoted rate shall be for finished items and shall be complete in all respects including the cost of all materials, labour, tools & plants, machinery etc., all taxes, duties, levies, octroi, royalty charges, statutory levies etc. applicable from time to time and any other item required but not mentioned here involved in the operations described above. The quoted rate shall also include the cost of providing of vehicle (Ambassador or equivalent) in excellent working condition for official use of site staff of I.P. College during project duration including the period of extension granted, if any, limited to 500Km per month, in addition to this the contractor shall also provide suitable office accommodation including storage and furniture including maintenance. The Employer shall not be supplying any material, labour, plant etc. unless explicitly mentioned so.

1.18 The entire works shall be liable to be inspected by Chief Technical Examiner i.e. CTFJ CVC and ISO auditors. The contractor shall provide all necessary help required for in this connection. The contractor shall have to comply with the procedures/ observations/ suggestions of the CTE / ISO in respect of quality, specifications and workmanship in his scope of work, if any. No extra payment shall be made on this account. However any recovery arising out of the CTE's observation shall be borne by the contractor.

1.19 All the expenditure incurred towards payment to the local body for getting electrical/ power load, sewer line and water supply connection for Employer shall be reimbursed on production of proof of payment. The contractor shall be promptly extended all assistance in this connection.

1.20 Field testing arrangements along with two skilled and two unskilled manpower and equipment are to be made available and maintained at site by the contractor to carry out mandatory field tests as per CPWD specifications. The field tests shall be as listed in CPWD specifications and the equipments to be kept at site are Compressive strength testing machine, set of 6 Nos. of cube moulds of size 150 mm with temping rod, sieve sets for Coarse and Fine sand, cylindrical flask for testing silt content (2 Nos.), weighing balance with weights, equipment for testing initial and final setting time of cement and other apparatus required to fulfill the requirements of mandatory field tests as per CPWD norms.

A. Quantities mentioned in the tender document is preliminary based on site inspection, the actual quantity may vary during execution. The contractor is bound to execute the additional quantity at the same rate as mentioned against the quoted items. In case of quantities are lower than the tender document, the contractor shall be paid as per the actual quantity executed and he shall have no claim or disputes on the balance quantity.

B. For item not covered under the tender document, i.e for extra items, the contractor is bound to execute the cost as per the owner / Architect / consultants specifications and drawings at the market rate derived by the consultant. Nothing extra shall be paid for this amount.

EARTHING

1.0 **SCOPE**

This chapter covers the essential requirements of earthing system components and their installation. This shall be read with Appendix F, which lays down criteria for their design. For

details not covered in these specifications IS code of Practice on Earthing (IS: 3043-1987) shall be referred to.

1.1 **APPLICATION**

(i) The electrical distribution system in the Department is with earthed neutral (i.e. neutral earthed at the transformer / generator end). In addition to the neutral earthing, provision is made for earthing the metallic body of equipments and non-current carrying metallic components in the sub-station, as well as in the internal/external electrical installations.

(ii) Earthing system is also required for lightning protection, computer installations and hospital operation theaters, etc. for functional reasons.

(iii) Earthing requirements are laid down in Indian Electricity Rules, 1956, as amended from time to time, and in the Regulations of the Electricity Supply Authority concerned. These shall be complied with.

(iv) **Application for Internal E.I.**

a) Every sub-main will have earth continuity conductor to run along with sub-main wiring. In case of 3-phase sub-main wiring two earth continuity conductors shall be provided.

b) Every circuit will have its earth continuity conductor to alongwith circuit wiring. In case of 3-phase sub-main wiring two earth continuity conductors shall be provided.

c) Looping of earth is allowed only in case of point wiring.

d) When 2/3 power outlets are looped to one circuit, earth looping of these outlets is permissible.

1.2 **TYPES OF ELECTRONIC & MATERIAL**

8.2.1 Earth Electrodes

8.2.1.1 Types

The type of earth electrode shall be any of the following, as specified. (For selection criteria in designs, Appendix F may be referred to).

(d) Pipe earth electrode.
(e) Plate earth electrode.
(f) Strip or conductor earth electrode.

1.2.1.2 Electrode materials and dimensions.

(i) The materials and minimum sizes of earth electrodes shall be as per Table IX.

(ii) GI pipe electrodes shall be cut tapered at the bottom, and provided with holes of 12mm dia, drilled not less than 7.5 cm from each other upto 2 m of length from the bottom.

(iii) The length of the buried strip or conductor earth electrode shall be not less than 15 m. This length shall suitably be increased if necessary, on the basis of the information

available about soil resistance, so that the required earth resistance is obtained. Prior approval of the Engineer-in-charge shall be taken for any such increase in length.

(iv) All hardware items used for connecting the earthing conductor with the electrode shall be of GI in the case of GI pipe and GI plate earth electrodes, and forged tinned brass in case of copper plate electrodes.

1.2.2 Earthing Conductor & sizes

(i) The earthing conductor (protective conductor from earth electrode up to the main earthing terminal/earth bus, as the case may be) shall be of the same material as the electrode, viz. GI or copper, and in the form of wire or strip as specified.

(ii) The size of earthing conductor shall be specified, but this shall not be less than the following (For calculating the size of the earthing conductor in design, Appendix F para 3.5.1).

(d) 4mm dia. (8 SWG) copper wire.
(e) 25mm x 4mm in the case of GI strip, or,
(f) 20 mm x 3mm in the case of copper strip.

(iii) Earthing conductor larger than the following sectional areas need not be used, unless otherwise specified.

(c) 150 sq.mm. in case of GI, or,
(d) 100 sq.mm. in case of copper.

1.2.3 Earth continuity / loop earthing conductor & sizes

(i) The material and size of protective conductors shall be as specified Below (for criteria in design of these appendix F may be referred to):

Size Phase Conductor	Size of protective conductor of the same material as phase conductor
Upto 4 sq.mm	4 sq.mm.
Above 4 sq.mm up to 16 sq.mm.	Same size as phase conductor
Above 16 sq.mm up to 35 sq.mm.	16 sq.mm.
Above 35 sq.mm.	Half of the phase conductor

1.3 LOCATION FOR EARTH ELECTRODES

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

(ii) The location of the earth electrode will be such that the soil has a reasonable chance of remaining moist as far as possible. Entrances, pavements and roadways, should be avoided for locating earth electrodes.

1.4 INSTALLATION

1.4.1 Electrodes

1.4.1.1 Various types of electrodes

(i) (a) Pipe electrode shall be buried in the ground vertically with its top at not less than 20 cm below the ground level. The installation shall be carried out as shown in Fig. 11.

(b) In locations where the full length of pipe electrode is not possible to be installed due to meeting a water table, hard soil or rock, the electrode may be to reduced length, provided the required earth resistance result is achieved with or without additional electrodes, or any alternative method of earthing may be adopted, with the prior approval of the Engineer-in-charge. Pipe electrodes may also be installed in horizontal formation in such exceptional cases.

(ii) Plate electrode shall be buried in ground with its faces vertical, and its top not less than 1.5 m below the ground level. The installation shall be carried

(iii) When more than one electrode (plate/pipe) is to be installed, a separation of not less than 2 m shall be maintained between two adjacent electrodes.

(iv) (a) The strip or conductor electrode shall be buried in trench not less than 0.5 m deep.

(b) If conditions necessitate the use of more than one strip or conductor electrode, they shall be laid as widely distributed as possible, in a single straight trench where feasible, or preferably in a number of trenches radiating from one point.

(c) If the electrode cannot be laid in a straight length, it may be laid in a zigzag manner with a deviation upto 45 degrees from the axis of the strip. IT can also be laid in the form of an arc with curvature more than 1 m or a polygon.

1.4.1.2. Artificial treatment of soil

When artificial treatment of soil is to be resorted to, the same shall be specified in the schedule of work. The electrode shall be surrounded by charcoal / coke and salt as indicated in Fig. 11 and 12. In such cases, excavation for earth electrode shall be increased as per the dimensions indicated in these figures.

1.4.1.3 Watering arrangement

(i) In the case of plate earth electrodes, a watering pipe 20 mm dia. Medium class pipe shall be provided and attached to the electrodes as shown in Fig. 9 and 10. A funnel with mesh shall be provided on the top of this pipe for watering the earth.

(ii) In the case of pipe electrodes, a 40 mm x 20 mm reducer shall be used for fixing the funnel with mesh.

(iii) The watering funnel attachment shall be housed in a masonry enclosure of size not less than 30 cm to 30 cm x 30 cm.

(iv) A cast iron / MS frame with MS cover, 6mm thick, and having locking arrangement shall be suitably embedded in the masonry enclosure.

1.4.2 Earthing conductor (Main earthing lead)

(i) In the case of plate earth electrode, the earthing conductor shall be secured as indicated in fig. 11 using a through bolt, nuts and washers and terminating socket.

(ii) In the case of pipe earth electrode, the earthing conductor shall be securely terminated on to the plate with two bolts, nuts and washers and terminating socket.

(iii) A double C-clamp arrangement shall be provided for terminating tape type earthing conductor with GI watering pipe coupled to the pipe earth electrode. Galvanized "C" shaped strips, bolts, washers, nuts and check nuts of adequate size shall be used for the purpose.

(iv) The earthing conductor from the electrode up to the building shall be protected from mechanical injury by a medium class, 15mm dia. GI pipe in the case of wire, and by 40mm dia, medium class GI pipe in the case of strip. The protection pipe in ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floors to adequate depth in due co-ordination with the building work.

(v) The earthing conductor shall be securely connected at the other end to the earth stud/earth bar provided on the switch board by:

(c) Soldered or preferably crimped lug, bolt, nut and washer in the case of wire, and
(d) Bolt, nut and washer in case of strip conductor.

In the case of substations or alternators, the termination shall be made on the earthing terminal of the neutral point on the equipment and/or the earth bus, as the case may be.

1.4.3 Loop Earthing/Earth continuity Conductor

(i) Earth terminal of every switchboard in the distribution system shall be bonded to the earth bar/terminal of the upstream switch board by protective conductor(s).

(ii) Two protective conductors shall be provided for a switchboard carrying a 3-phase switchgear thereon.

(iii) Loop earthing of individual units will not be however necessary in the case of cubicle type switchboards.

(iv) The earth connector in every distribution board (DB) shall be securely connected to the earth stud/earth bar of the corresponding switch board by a protective conductor.

(v) The earth pin of socket outlets as well as metallic body of fan regulators shall be connected to the earth stud in switch boxes by protective conductor. Where the switch boxes are of non-metallic type, these shall be looped at the socket earth terminals, or at an independent screwed connector inside the switch box. Twisted earth connections shall not be accepted in any case.

1.5 **EARTH RESISTANCE**

(i) The earth resistance at each electrode shall be measured. No earth electrode shall have a greater ohmic resistance than 5 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be up to 8 ohms.

(ii) Where the above stated earth resistance is not achieved, necessary improvement shall be made by additional provisions, such as additional electrode (s), different type of electrode, or artificial chemical treatment of soil etc., as may be directed by the Engineer-in-Charge.

1.6 **MARKING**

(i) Earth bars/terminals at all switch boards shall be marked permanently, either as "E" or as

(ii) Main earthing terminal shall be marked "SAFETY EARTH – DO NOT DISCONNECT".

1.7 **USE OF RESIDUAL CURRENT DEVICES (RDCs)**

An extract on selection and application of RCDs (also known as RCCBs) from IS: 12640-1988 is given at Appendix G. Provision of RCD shall be specified in individual cases keeping in view the type, use, importance, system of earthing and nature of electrical installations to be protected by the RCCBs, requirements of the local electric supply company, etc. The sensitivity shall be 30mA, 100mA, 300mA, or 500mA, as specified.

TABLE IX
Materials and sizes of earth electrodes
[Clause 8.2.1.2 (i)]

Type of Electrode	Material	Size
Pipe	GI medium class	40mm dia 3.45m long (Without any joint)
Plate	(i) GI (ii) Copper	60 cm x 60 cm x 6 mm thick 60 cm x 60 cm x 3 mm thick
Strip	(i) GI (ii) Copper	100 sq.mm section 40 sq.mm section
Conductor	(i) Copper	4mm dia (8 SWG)

Note: Galvanization of GI items shall conform to Class IV of IS: 4736-1986.

MOULDED CASE CIRCUIT BREAKERS:
Moulded case circuit breakers shall be of adjustable current setting type with trip free manual closing mechanisms. MCCB s shall confirm to IS: 1397-1, 2(1993). They shall of single break type but preferably double break. They shall be trip free from all positions and temperature compensated for thermal type only. Suitable discrimination shall be provided between upstream and downstream breakers in the range of 8 milliseconds upwards. All molded case circuit breakers will have front operated extended rotary handle offering IP54 protection. They shall have minimum watt loss per pole. The closed and open positions must be as per clause in IS part – I of the IS standard. MCCB cover and case shall be made of high strength heat resistant and flame resistant thermosetting insulating material, operating handle shall be quick make, quick break type. Front operating handle shall have a common operating handle for simultaneous operations and tripping of all three phases. All MCCB s shall have indication light for ON.
MCCB shall be extra current limiting type. All capacities taken are service breaking capacity. The MCCB shall be suitable for aluminium terminations. All the MCCBs shall have variable trip setting facility

which could be adjusted easily at site. It shall have clear TRIP position marked in front. MCCB shall have provision of adding in future accessories like under voltage trip, shunt trip, alarm switches, earth fault and earth leakage for fitting if required. Whenever interlocking is required, suitable selection shall be made. The MCCB shall have extended links with phase barrers and temp. Of links shall not reach beyond the limits specified in IS.

MINIATURE CIRCUIT BREAKERS:

It shall comply IEC 898-1995. The MCB be suitable for DC and 400 Hz application. The MCB shall be made of self extinguishing troicalised (95% humidity 55% material). The MCB shall have a trip free toggle mechanism. The contact closing shall be independent of operator speed.

The terminal shall be protected against any finger contact to IP 20 degree of protection with no restriction for line and load. The breaking capacity shall be 10 KA in accordance with IS 898-1995, watt loss per pole shall be as per IS 898-1995. The rated impulse voltage (Vimp) of MCB shall be 6KV. The MCB shall be capable of being used as incomer and isolator application and shall have provision of accessories like auxiliary switch, alarm switch, shunt trip and under voltage trip. The manufacturer shall define the tripping characteristics of their MCBs and furnish the respective tripping curves.

AIR CIRCUIT BREAKERS:

Circuit breaker shall be air break type with draw out design confirming to the relevant Indian standards. All the circuit breakers of the panel will be mounted in separate cubicles and will be of same make to maintain the uniformity.

The breakers will be draw out type and will be mounted on a rigid steel frame moving on horizontal ball, telescopic slides offering minimum of friction. The system will have horizontal, self aligning, isolation pairs of moving and stationary power and control contacts. The unit will have three horizontal positions corresponding to.

a) Plugged in position:

Here both the power and control contacts are in made position and the breaker gets mechanically locked in this position. The breaker can go in ON position only after being locked in this position.

b) Test position:

Here the power contacts get isolated where the control contacts can be kept in made status. The breaker can be mechanically locked in this position and made ON and OFF for testing purposes.

c) Withdrawn position :

In this position the power and control connections are in isolated status and the moving portion of the breaker can be dismantled from the panel. An isolating shutter or set of shutters are to be provided for the automatic coverage of live power and control fixed isolating contacts in the withdrawn position.

All the breakers with remote closing arrangement will have a spring charging motor of single phase 230V and a closing coil. In case of power failure the spring charging can be done manually with the help of button or lever. The circuit breaker should switch on only when the spring is charged fully which should be able to store energy for one closing and one tripping operation. The spring will also get fully charged when the breaker is in closed position. In this case the spring should store energy to make first tripping, one reclosing and the second tripping.

The breaker will have quick making trip free closing mechanism. The operation of the mechanism will be independent of the speed of the closing lever or the duration of the closing signal.

All breakers will have switching ON and OFF time less than 4 cycles and will have the following interlocks for the safe operation of the equipment:

- Breaker to ON only when mechanically locked in any of the three horizontal position.

- When the breaker is in "plugged in" in position it will ON only when the front door is closed.

The breakers will be provided with 6 Nos. each of type NO and NC auxiliary contacts rated for 10Amps AC at 415 V and 6 Amps DC at 48 V. These contacts are in addition to the ones already in use for the operation of the breaker and will be required for subsequent interlocks incorporated in near future.
Whenever requested mechanical positive interlocks will be provided between the operation of different breakers with the help of individually unique and suitable castle key locks.

MOTOR PROTECTION CIRCUIT BREAKERS:
The MPCB shall be offered for protection to motors against overload, short circuit and phase failure. It shall have quick make, quick break mechanism and shall be capable of operating in ambient temperature ranging from -20 to +60 degree centigrade (without any deration). This shall be temperature compensated. The MPCB shall comply with IS/IEC 947 standards IS 13947 – 1, 2&4(general standards). The MPCB shall be suitable as defined by IS 13947- I suitability for isolation. The MPCB shall have minimum breaking capacity of 15 KA at 415V, AC, 50Hz. The MPCB shall have a electrical life of more than 50000 operations.
The MPCB shall have a provision with adjustable overload and sealing facility from protection against tampering. It shall have test push to trip facility in the front with facility of padlocking.

TESTS TO BE CONDUCTED PRIOR TO DISPATCH
- Visual check for damage

- Check equipments specifications.

- Checks generally all contacts, hardware.

- Continuity and earthing.

- Polarity of current transformers.

- Breaker mechanism and alignment.

- Simultaneous closing of all poles in breaker.

- Meggaring of all equipments for phase to phase and phase to earth.

- High voltage test.

- All functional tests.

TECHNICAL SPECIFICATION OF VCB PANEL

GENERAL

The technical specifications covers the equipment to be supplied, delivered, erected and commissioned for 11 KV Panels suitable for 11 KV 3 Phase earth system, 50 Hz, AC supply with a fault level of 350 MVA at 11 KV.

STANDARDS AND CODES

The following Indian Standards specifications and codes of Practice will apply to the equipment and the work covered by the Codes of Practice will apply to the equipment and the work covered by the Scope of this Contract. In addition, the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1926 as amended upto date shall also apply. Where ever appropriate standards are not available, relevant British and/or IEC Standards shall be applicable.

ISO 9001 – 2000 certified equipment shall be used as a part of the Contract in line with Government Regulations. Necessary test certificates in support of the specification shall be submitted prior too supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

- 11000 Volt Circuit Breaker	IS 13118
- Metal Enclosed Switchgear and Controlgear For voltages above 1000 volts	IS 3427: 1969
- Electrical Relays for Power System Protection	IS 3231: 1986
- Voltage Transformers	IS 3126 Parts I to IV 1978
- Current Transformers	IS 2702: 1981 Part I to IV
- Specifications for Dry Type Power Transformers	IS 11171: 1982
- Code of Practice for Installation And Maintenance of Transformers	IS 10028: 1981
- Rubber Mats for Electrical Works	IS 2424: 1983
- PVC Sleeving for Electrical purposes	IS 1921: 1961
- Danger Notice Plate	IS 2221: 1982

11000 VOLT CIRCUIT BREAKERS

TECHNICAL PARAMETERS

The 11000 volt circuit breakers shall be triple pole Vacuum Circuit breaker as specified suitable for indoor mounting with the requirements of the relevant Indian Standards. The Circuit Breakers shall be suitable for operation at 11000 volts 3 phase 50 Hz supply system and shall have a certified symmetrical breaking capacity of 350 MVA at 11000 Volts or as specified.

CIRCUIT BREAKER CONSTRUCTIONAL FEATURES

The 11000 Volt circuit breaker shall be suitable for flush front, metal clad, truck mounted, vertical isolation, horizontal draw out type and fully interlocked. The truck that carries the Circuit Breaker shall be of rigid fabricated construction Each Circuit breaker shall be housed in a separate compartment enclosed on all sides. Each withdrawal truck shall have its own Circuit Breaker.

All electrical connections on the truck shall be brought to secondary plugs, which engage similar sockets in the housing. The draw out mechanism shall be so designed and constructed as to permit smooth withdrawal and insertion. The movement shall be free of jerks, easy to operate and positive.

Sheet steel barriers shall be provided between
-Instrument Panel and Potential Transformer
-Instrument panel and Current Transformers
-Busbar chamber and Circuit Breaker compartments

Vacuum circuit breaker shall have an assembly of three Vacuum interrupters of proven design. The Vacuum interrupters offered shall be of similar make as that of the circuit breaker.

CIRCUIT BREAKER OPERATING MECHANISM

The Circuit Breaker shall be trip free and equipped with a 230 V AC motor charged closing mechanism shall be such that the Circuit Breaker is at all times free to open immediately the trip coil is energized.

Mechanical ON/OFF position indication shall be provided on the front of the circuit breaker. The operating mechanism shall be mounted on the front panel of the truck.

The operating handle and the mechanical trip push button shall be at the front of and integral with the Circuit Breaker.

The operating mechanism shall provide distinct and separate positions of the Circuit Breaker on the cradle.
-Service
-Test
-Isolated
-Maintenance

CIRCUIT BREAKER INTERLOCKING

Breaker shall be provided with the following mechanical safety Interlocks to ensure protection of the equipment and the operator.

The Circuit breaker cannot be unless it is in the ‘PLUGGED IN’ position.

Breaker cannot be withdrawn from or pushed into the housing unless the main contacts are open.

Circuit Breaker cannot be put into service without making the secondary connections between the truck and housing.
The cover of the draw out voltage transformer cannot be opened unless the transformer is isolated.

CIRCUIT BREAKER AXILLARY CONTACTS

Each Circuit Breaker shall be provided minimum of 6 N.O. and 6 N.C. auxiliary contacts. These contacts shall close before the main contacts when the circuit Breaker is plugged in and vice versa when the Circuit Breaker is lowered.

PROTECTION RELAYS

The Circuit Breaker shall have over current, earth fault protection and auxiliary relay devices as specified in the schedule of Quantities. The relays shall be mounted flush on a separate compartment with the access from the rear for wiring and maintenance. The trip circuit supervision relay and master trip relay in each panel shall be required besides over current and earth fault protection.

POTENTIAL AND INSTRUMENT TRANSORMERS

A draw out type cast resin voltage transformer shall be mounted in the panel and connected to the Line. This shall be arranged for Horizontal isolation.

The Circuit Breaker shall have the required current transformers as specified in the Schedule of Quantities for metering and protection mounted outside the Circuit Breaker compartment but within the free standing cubicle. The transformers shall comply to the relevant Indian Standards. All Transformers for metering shall be Accuracy Class 1 and of capacity 15 VA and ratio as required. Dual core current transformers shall be provided for metering and protection.

INSTRUMENTATION

Instruments and indicating lamps as required in the Schedule of Quantities shall not be mounted on the Circuit Breaker compartment door. A separate adequate compartment shall be provided. The instruments and relays shall be accessible for testing and maintenance without danger of accidents contact with the parts in the Switch gear Panel.

Square pattern flush mounting meters and selector switches of the three way and OFF pattern complying with the requirements of the relevant Indian Standards shall be used.

The current transformers for metering and protection shall be mounted on the solid copper bus bar with proper supports.

Neon type indicating lamps shall be provided for phase and other operational indications.

EARTHING

One main earth bus bar of G.I. copper shall be provided throughout the length of the Switchgear Panels to provide an integral earthing to the entire switchboard.

DESIGNATION LABELS

Suitably engraved white on black nameplates and identification labels of metal for all Panels and circuits shall be provided. These shall indicate the feeder number and the designation.

SHEET STEEL TREATMENT AND PAINTING

Sheet steel treatment used in the construction of the Switchgear panels should have powder coating finish and should have undergone seven tank painting process.

All sheet steel work shall after metal treatment be powder coated with two coats of shade 631 to IS 5. Each coat of paint shall be properly stored and the paint thickness shall be not less than 20 microns.

INSTALLATION

The foundations prepared as per the manufacturers drawings shall be leveled, checked for accuracy and thereafter the Switchgear Panels installed. All bus bar connections shall be checked with a feeler gauge after installation. The cable end boxes shall be scaled to prevent the entry of moisture. The main earth bars shall be connected to the sub-station earths.

A 12mm thick rubber matting of approved make shall be provided in front of the Switchgear Panels and along its entire length. The width of the rubber matting shall be 1000mm. The rubber mat shall withstand 12 KV for 1 minute and leakage current shall not exceed 160-mA/sq.m. After installation of the Switchgear Panels, these shall be tested prior to commissioning.

TESTING AND COMMISSIONING

Prior to commissioning the following tests shall be carried out

Mechanical operation of the Circuit Breakers.

Insulation resistance test shall be carried out between phases and phases and earth.

Accuracy and operation of all control and protection relays and tripping sequences shall be checked.

TECHNICAL SPECIFICATIONS (M.V. CUBICLE BOARD)

1. GENERAL

The Panel shall be indoor type having incoming, sectionalisation and outgoing switchgear as specified. The design shall be cubicle type. The degree of Enclosure protection shall be IP 42.

2. CONSTRUCTION FEATURES:

The panel shall be floor mounted freestanding type, dust and vermin proof and shall include all provisions for safety of operating and maintenance personnel. The general construction shall conform to relevant IS for factory assembled panel.

The panel shall be fabricated out of sheet steel not less than 2.0mm thick. Wherever necessary, such sheet steel members shall be stiffened by angle iron framework.

General construction shall employ the principle of compartmentalization and segregation for each circuit.

The Compartment door shall be so interlocked that it shall not be possible to open the door with the switch in ON position. An arrangement for defeating this door interlock shall be provided for testing purposes.

Overall height of the board shall not exceed 2.0 metres. Operating levers, handle etc. of highest unit shall not be at a height more than 1.7metres for convenience of operation and cable termination. There shall be gap of at least 13.50mm between the floor level and the bottom most units.

Multi-tier mounting of feeders is permissible. The general arrangement for multi-tier construction shall be such that the horizontal tiers formed present a pleasing and aesthetic look.

All cable entries shall be through gland plates. Suitable numbers of knockouts for cable entry shall be provided to take care of the present and future requirements.

The construction shall include necessary cable supports for clamping the cable in the cable alleys or rear cable chambers.

The design of framework and end covers shall be such as to require a minimum number of screws visible from outside.

The general arrangement shall be got approved before fabrication.

3. BUS BAR:

The bus bar shall be of aluminium of high conductivity electrolytic quality and of adequate section.

The minimum cross section of bus bar shall be as per size specified below:

Current ratings in Amp. Up to	Recommended rectangular cross-section			
	Aluminium		Copper	
	No. of Strips/ phase	Size in mm.	No. of Strips/ phase	Size in mm.
100	1	20 x 5	1	20 x 3
200	1	30 x 5	1	25 x 5
300	1	50 x 5	1	40 x 5
400	1	50 x 6	1	50 x 5
500	1	75 x 6	1	60 x 6
600	1	80 x 6	-	-
800	1	100 x 6	-	-
1000	1	100 x 10	-	-
1200	1	125 x 10	-	-
1600	2	100 x 10	-	-
2000	2	125 x 10	-	-
2500	3	125 x 10	-	-

Note:

The sections can be accepted in other rectangular cross-sections and numbers also, provided the total cross-sectional area offered is not less than the total cross-sectional area shown in the above table against the respective bus-bar rating. Necessary tolerance as per relevant IS shall be permissible.

The bus bar system may comprise of a system of horizontal and vertical bus bars run in bus bar alleys. The circuit could be arranged on either side of the bus bar. In the case of rear access, horizontal bus system shall run suitably either at the top or bottom.

Minimum clearance to be maintained for air insulated Panel for medium voltage application shall be as follows:

Between	Minimum Clearance
Phase to Earth	26mm
Phase to Phase	32mm

Bus bar support insulation shall be made of non-hygroscopic, noncombustible, tack resistant high strength SMC / DMC material and shall be of suitable size and spacing to withstand the dynamic stress due to short circuit currents.

All connections to individual circuits from the bus bar shall be with solid connections and the same shall be extended upto connector / insulated stud capable of taking cable / Bus-bar trunking of size suitable for that circuit. The connector / insulated stud shall be located near the respective cable entry points in the cable alley.

All bus bars and connections shall be suitably sleeved with PVC Heat Shrinkable sleeves or suitably insulated in an approved manner.

4. PAINTING:

All sheet work shall undergo a process of degreasing, pickling in acid, cold rinsing phosphating, passivating and then be sprayed with high corrosion resistant primer. The primer shall be baked in an oven. The finishing treatment shall be by applying a minimum of two or more coats and powder coated of approved shade.

5. INDICATION LAMPS:

5.1 Each INCOMER shall have:

1. A set of three indicators (RED, YELLOW & BLUE) for indicating the healthiness of the incoming phases.
2. A set of two indicators, RED for OFF status and GREEN for ON status of the incoming switches.

5.2 Each outgoing shall have a set of two indicators, RED for OFF status and GREEN for ON status of the outgoing switch.

5.3 Each indicator shall be of multiple LED type.

Supply to the indicators shall be protected through MCB of suitable rating.

6. CONTROL WIRING:

All control and indication wiring etc. shall be with suitable copper conductor PVC insulated cables conforming to relevant specifications.

Runs of wires shall be neatly bunched and suitably supported and clamped.

Identification ferrules shall be used at both ends of the wires.

All control wirings meant for external connection are to be brought out on a terminal board to be located near the cable entry meant for such external cables.

7. INSTALLATION:

The installation work shall cover assembly of various sections of the panels lining up, grouting the units etc.

In the case of multiple panel switchboards after connecting up the bus bars etc. all joints shall be insulated with necessary insulation tape or approved insulation material.

A common earth bar shall be run at a suitable location in the panel. It will be ensured that all metal parts of the panel are connected to this earth bar system. The recommended size of earth bus bar shall be in accordance with general specification for electrical works (Part I internal as amended upto date). However minimum size of earth lead shall be 20 mm x 4mm copper or 25mm x 5mm GI Strip.

8. TESTING AND COMMISSIONING:

Commissioning checks and tests shall include the following:

(a) Operational checks.

(b) Interlock function checks.

(c) Continuity checks of wiring, fuses etc. as required.

(d) Insulation test: When measured with 3.500 V Megger the insulation resistance shall not be less than 100 mega ohms.

(e) Trip tests and protection gear test.

SPECIAL CONDITIONS OF CONTRACT

1) The electrical contractor shall be in possession of valid contractor's license and shall posse's senior electrical engineer with minimum 2 years' experience for degree holder and minimum 8 years' experience for diploma holder.

2) The successful contractor himself shall execute the work. Sub-letting of work will not be allowed.

3) The work shall be carried out carried out as per Specification and as per manufacturers design and recommendations. If the specifications for any item are not available in the specifications cited above, relevant IS specifications shall be followed. In case ISI specifications are also not available, the decision of the Electrical consultant given in writing based on acceptable sound Engineering Practice and local usage shall be final and binding on the contractor.

4) All the material to be used on the work shall be of superior quality and shall have to be got approved from the Engineer-In-Charge/Electrical consultant before use at site.

5) The contractor shall make his own arrangement for the safe custody / storage of his material. Theft, pilferage, breakage, damage if any during the storage / execution of the work, shall be replaced / rectified by the contractor at his own cost.

6) The contractor is bound to sign the entry/ entries made by the Engineer-In-Charge or his representative in the site order book time to time.

7) Good workmanship is an essential requirement for compliance with the rules & specifications.

8) The entire installation shall be at the risk and responsibility of the contractor until these are tested and handed over to the department.

9) Notwithstanding the bill of quantity, all items of inter-related work considered necessary to make installation complete and operative should be deemed to be included by the contractor at no extra cost.

10) The equipment and the installation shall conform to various Indian Standards amended up to date wherever applicable.

11) The department's authorized representative shall have full powers to inspect the drawings of any portion of the work or examine the materials and workmanship of the equipment at the Firm's works or at any other place from where the material or equipment is obtained, if the department so desires. Acceptance of any material or equipment shall in no way relieve the firm of their responsibility for meeting the requirements of the specifications. In case, any equipment is found defective or of inferior quality the firm shall have to replace the same free of cost.

12) The firm shall comply with all bye-laws and regulations of local and statutory authorities having jurisdiction over the works and shall be responsible for payment of all fees and other charges and giving / receiving all necessary notices and keep the Engineer-in-Charge informed.

13) Fees, damages, cost and charges of all and every sort that may be legally incurred in respect thereof shall be borne by the firm/contractor.

14) It shall be Firm's liability to follow all safety procedures in accordance with relevant I.S. specifications / fire-by-laws or any other statutory rules / regulations amended up to date during execution of work at site.

15) If the completed installation / equipment or any portion thereof, after it is taken over, is found to be defective or fails to fulfill the intent of the specifications, the Firm shall on receipt of a written notice from the Engineer-in-Charge, forthwith make good the defective installation / equipment. Should the firm fail to rectify the defects / make good the defective installation / replace the equipment at no extra cost, within a stipulated time mentioned in the written notice, institute may get the work done at the risk and expenses of the Firm.

16) The institute reserves the right to make changes in the specifications of the work if in its opinion the same is found necessary. However such alterations shall be made after mutual discussion and agreement between the institute and the firm. Any price implication in this regard shall be mutually discussed and agreed upon in terms of relevant clause of the contract.

17) The works shall be executed in close co-ordination with the progress of Building works. This being essences of the contract, no claim for idle labor will be entertained.

18) It will be the responsibility of the contractor to obtain electrical no objection certificate from Chief electrical inspector of the electrical department Govt. of Delhi before commissioning of transformer and shall comply instructions contained in Indian Electricity rules. All the tests shall be carried out as per Indian Electricity rules before commissioning of transformer. Dehydration of transformer oil be got tested and test certificates are to be submitted. 11KV cable used on work be got done before procurement of cable and manufacturers certificate is to be attached before commissioning of cables.

19) All the cable certificates are to be submitted along with running bills.

20) Meggar test and earth test to be done in presence of Engineer- In- Charge.